Saint Petersburg University
Graduate School of Management

Master in Corporate Finance

LONG-RUN PERFORMANCE OF GROWTH CAPITAL-BACKED IPOS

Master's Thesis by the 2nd year student
Concentration – Master in Corporate Finance
Rybin Nikita

Research advisor:
Marat V. Smirnov, Senior Lecturer

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АННОТАЦИЯ

Автор	Рыбин Никита Дмитриевич
Название ВКР	Долгосрочная результативность первичных размещений компаний, обеспеченных ростом инвестиций в материальные активы
Образовательная программа	080200 “Менеджмент”
Направление подготовки	Корпоративные финансы
Год	2021
Научный руководитель	Марат Владимирович Смирнов, к.э.н.
Описание цели, задач и основных результатов	Целью данной работы является определение долгосрочной результативности специального типа компаний, которые характеризуются финансированием венчурного фонда и следующим за первичным размещением ростом инвестиций в материальные активы. Кроме того, была поставлена цель изучить факторы, влияющие на долгосрочную результативность акций таких компаний. Для достижения цели был проведен комплексный анализ существующей научной литературы с последующим выявлением показателей результативности и ее потенциальных факторов. На основе анализа литературы были определены подходящая методология исследования и потенциальные переменные, потенциально влияющие на результативность. Соответственно, был выдвинут ряд гипотез для проверки. Выборка исследования включает в себя 85 первичных размещений специальных компаний на основных биржах США (NYSE и Nasdaq), рассматриваемый временной период – с 2007 по 2018 годы. По итогам эмпирического анализа были предложены рекомендации для потенциальных заинтересованных сторон. Результаты анализа результативности первичных размещений подтвердили, что компании с ростом инвестиций в материальные активы действительно имеют высокую положительную долгосрочную доходность (статистически отличимую от нуля) относительно других типов размещений. Результаты демонстрируют зависимость результативности специальных первичных размещений от краткосрочной результативности, объема эмиссии, операционной ликвидности и рентабельности активов. Переменная рентабельности активов особенно эффективно объясняет результативность как в линейных моделях, так и в моделях с вероятностным исходом. Таким образом, в работе были проанализированы результативность первичных размещений обеспеченных ростом вложений в материальные активы и факторы, влияющие на нее. Результаты могут быть потенциально полезны для инвесторов, аналитиков и посредников сделки.
Ключевые слова	Рыночная доходность акций, первичное публичное размещение, венчурное финансирование, факторы результативности первичного размещения

ABSTRACT

Master Student's Name	Nikita Rybin
Master Thesis Title	Long-Run Performance of Growth Capital-Backed IPOs
Educational Program	080200 “Management”
Main field of study	Corporate Finance
Year	2021
Academic Advisor’s Name	Marat V. Smirnov, Senior Lecturer
Description of the goal, tasks and main results	The main goal of this study is to examine the long-run performance of a specific venture capital-financed (growth capital-backed) IPOs and to observe which factors influence such performance. For the goals’ accomplishment, comprehensive literature analysis was performed with subsequent measurements’ and factors’ identification. Moreover, justified hypotheses about performance and influence of factors were stated. The sample of the research includes 85 initial public offerings of growth capital-backed companies on major US exchanges (NYSE & Nasdaq), the time period under consideration is from 2007 to 2018. After the empirical analysis we have obtained results and indicated their practical implementation. The findings of the performance analysis confirmed that such companies indeed have a high positive long-run aftermarket performance (statistically distinguishable from zero) relative to other types of IPOs. The results of an empirical study of the performance’ dependence on other factors suggest the statistically significant influence of short-term performance, issue volume, operating liquidity and return on assets. The return on assets variable is particularly effective in explaining aftermarket performance in both linear and probabilistic models. On the basis of findings important recommendations for various deal-players were made. Overall, the research introduces results of new type IPO long-run performance and factors which influence this performance. The results could be potentially useful for analysts, investors and owners of a business.
Keywords	Aftermarket performance, initial public offerings, venture capital, IPO performance

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INTRODUCTION

The presented research is devoted to the phenomenon of initial public offerings and their long-run performance. In this study I am going to analyze and examine specifically financed firms and their public performance. Generally, this special type of companies is characterized by investments in growth of tangible assets after initial public offering. Such type of companies was identified by Ritter (2015) and the evidence of their substantial aftermarket overperformance was presented. Therefore, relying on those results, the main goal of this study is to examine the long-run performance of a specifically financed (growth capital-backed) IPOs and to observe which factors influence such performance. The novelty of the concept and scarce number of previous researches lead us to the research problem of the presented paper. Moreover, the problem of performance's markers or determinants of this special types of initial offerings arises and will be solved during the empirical study.

To start with, I would like to mention that the long-run performance phenomenon of the initial offerings is well studied topic, there are researches starting from 1970s, there are various methodologies and statistical tests to prove theories, many of the studies provide their arguments for or against the usage of some factors, some of them study how various factors influence the performance of IPOs. The topic of initial offerings and their performance is still considered as a relevant and a lot of researches study how do these types of capital raising affect different stakeholders. This importance is mainly caused by financial and economic significance of the deals, the real market of IPOs is significant, and a lot of people and institutions are involved. For the analysts it is especially important to understand how various factors influence the performance, not only in long-run. Mainly, some operational and financial factors of companies and their influence on performance were analyzed. The comprehensive analyses are often being supplemented by the academic researches' conclusions and findings. Hence, considering such wide universe of studies, there was quite complicated task to narrow down the topic of this research and find clear research gap in this field of IPOs' performance. However, the article under the topic "Growth Capital-backed IPOs" introduces new type of initial offerings and their investments. This article became an essential underlying part of my research. It happened due to several reasons: first is that J. Ritter suggests completely new type of firms' financing, this is a unique situation because during previous several decades the researches mostly considered existing theories/concepts/types of IPOs and there was a lack of novelty. From my point of view, the paper "Growth Capital-backed IPOs" offers this novelty, and it is extremely interesting to study new concepts. The second reason is that there is clear academic/research gap since that is the only article about those companies.

The fact that analysts and investors seek for the new methodologies for initial offerings' analyses bears managerial implication of this study. This is due to the fact that the newly invented or defined type of financing – growth capital-backed IPO is considered as better performing in long-run according to Ritter (2015). The author states: "Since 1980, investing in growth capital-backed IPOs has produced mean 3-year style-adjusted buy-and-hold returns of +25.2%, in contrast to style-adjusted returns of approximately zero for other VC-backed and buyout-backed IPOs" (Ritter, 2015). Since these companies outperform others by significant values, the findings could be meaningful from the practical point of view, analysts, owners, intermediaries and investors could use the results in their initial offerings' estimation and use this technique as one additional instrument for analysis.

I suggest that the object of this research is growth capital-backed companies, while subject is the property of their long-run aftermarket performance. The research checks whether there is an overperformance on more relevant data, i.e., time span will include more recent observations. Moreover, the factors' influence on performance is observed. For completing the presented research, I have defined several objectives:

- Analyze the literature background in order to get broader view on the issues of initial offerings and the factors which influence performance
- From the prior studies' analysis identify the appropriate methodology for evaluating the long run performance and identify the pool of factors to check their influence on the performance
- Choose appropriate models for estimating the influence of factors and justify the choice
- Collect the necessary data sample for further analysis
- Calculate the performance of the firms and conduct appropriate data analysis
- Describe meaningful findings and results of the analysis

According to the goal and tasks of the study, the research questions being suggested: how the growth capital-backed IPOs perform in long-run? What are the factors of growth capital-backed IPOs' performance and how do they influence this performance? I propound that these question and goal are suitable for the research in general. The further research is divided into two major chapters. The first will include theoretical foundation which is divided according to main concepts of this study: initial public offerings, long-run performance and financed IPOs. Next, the second chapter or empirical research transitions theoretical discussion into practical area and it will include description and justification of proposed methodology, the data collection techniques, final sample description and econometric analysis. Finally, obtained results with limitations and further discussion will be introduced.

CHAPTER 1. THEORETICAL BACKGROUND OF INITIAL PUBLIC OFFERINGS

1.1. Initial public offerings

The presented part is devoted to the general phenomenon of initial public offerings. This general phenomenon is important to understand in terms of why companies do public capital raising, what are the objectives and the expected outputs of the initial public offering. These deals are considered as very complicated in terms of structure, involved intermediaries, financial processes included and etc. Hence, I want to consider the main points regarding these deals and the reasons from the academic perspective.

Generally speaking, initial public offering is the type of a financial deal when a company offers its stock to the public – institutional or retail investors through the intermediary of stock exchange. Capital raised could be used for further operations' development or for owners' purposes. This type of financial deal includes many procedures and intermediaries, from initial due diligence of company's financial, operating and legal indicators to finalization with the investor road shows with investment bank representatives. It includes many regulator involvements in these procedures as the proper processes should be provided in order to prevent fraud activities. One of the last and most significant modifications of regulator's requirements resulted in Sarbanes-Oxley Compliance act (Protiviti, 2016). It is a comprehensive regulatory legislation which includes many requirements for companies in order to prevent fraud activities. According to the U.S. Security and Exchange Commission, one of the most established market's regulators, initial public offering "or IPO, has referred to the first time a company offers its shares of capital stock to the general public. Under the federal securities laws, a company may not lawfully offer or sell shares unless the transaction has been registered with the SEC or an exemption applies" (U.S. SEC, n.d.). This complicated procedure is characterized by involvement of many stakeholders such as shareholders of a company, board of directors, management team, regulators, underwriters, stock exchanges and investors. All of them are connected and perform many functions/tasks in order to make the company public.

There exist several main reasons of why companies want to go public and offer their shares on the markets, usually the main are: raise additional capital for development, while other means of raising additional capital might be more expensive; growth of company in terms of size; publicity reasons, it could benefit for further operations/development. Moreover, the base reasons considered in the literature include cost of capital optimization and information asymmetry decreasing. The study by Pagano, Panetta & Luigi (1998) identifies reasons of going public and their importance while considering the option to offer shares to public. Besides the mention above reasons, the authors evidence the importance of similar firms' high valuation, i.e., hot market. Moreover, they find important association of size and probability to go public meaning that bigger

companies in terms of sales more likely to go public. Also, one of the findings suggests that publicity could bring the cheaper financing by debt. However, the study by Brau & Fawcett (2006) surveys CFOs which evidence the actual importance of the reasons and closes the gap between academic side and practical importance of the reasons. The significant considerations made are that cost of capital's minimization has low support among CFOs as primary reason, while they bring the importance of further acquisition activity. Moreover, they evidence limited shortlist of factors which influence underwriters for the procedure with reputation, quality of research and industry expertise being among the most important. Despite the mentioned reasons which seem to positively influence companies' conditions and indicators, Allison et al. (2016) indicate several disadvantages of going public among which are: high costs of a deal, extensive reporting to regulators, dilution of ownership, risk of management's distractions from core operations and increased complexity of corporate governance.

The market of initial offerings is highly developed nowadays, there are many opportunities for companies in terms of stock exchange choice, means of going public (e.g., SPAC, close-end investment funds), underwriters' offerings and many more. The US market is considered to be one of the most developed in terms of number and gross proceeds of initial offerings:

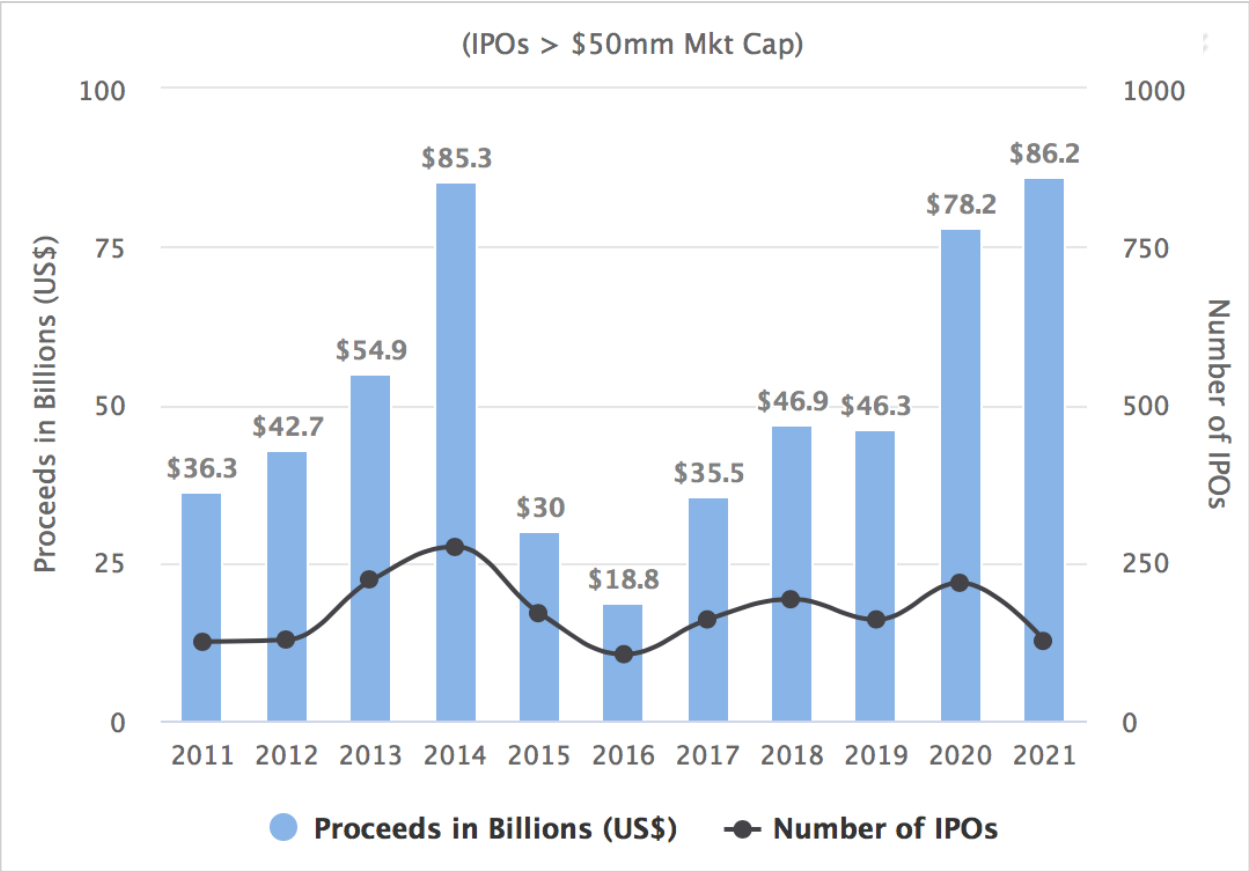
Table 1 Overview of IPO market by stock exchange as of 2012

Ranking	Name of Stock Exchange	IPO Proceeds (US$ billion)
1	New York Stock Exchange	21,5
2	NASDAQ	20,9
3	Tokyo Stock Exchange	11,7
4	Hong Kong Stock Exchange	10,8
5	Shenzhen Stock Exchange	10,3
6	Bursa Malaysia	7,06
7	Bolsa Mexicana de Valores (Mexican Stock Exchange)	6,0
8	London Stock Exchange	5,9
9	Shanghai Stock Exchange	4,9
10	Singapore Exchange	3,9

Source: [Deloitte report on Asian IPOs, 2013]

The second place share Asian markets with fast-developing IPO markets, the trends remain quite stable with slight changes over the past decade. By the number of IPOs, we can judge on the amounts offered and gross proceeds from the deals, the conclusion of the enormous market could be drawn:

Figure 1 Number of IPOs and proceeds overview



Source: [Renaissance Capital. IPO markets stats, 2021]

Even though the last year's crisis, the 2020 is characterized by the huge proceeds on initial public offering market.

According to KPMG consulting firm's report (2021) the market of IPOs nowadays breaks all the possible rules, there are records in the number of IPOs, in the number of more-than one billion IPOs and overall, the market could be considered as "hot-issue", i.e., investors are positively minded about the returns and performance (KPMG, 2021). All the stated market conditions, investors' sentiments and overall deal popularity are significant reasons of why this area is the topic of my interest and I want to investigate these issues in terms of academic perspective and to see the unobvious research opportunities in hot initial offerings' field, which consequently will lead to useful managerial recommendations for real users.

1.2. Long-run performance

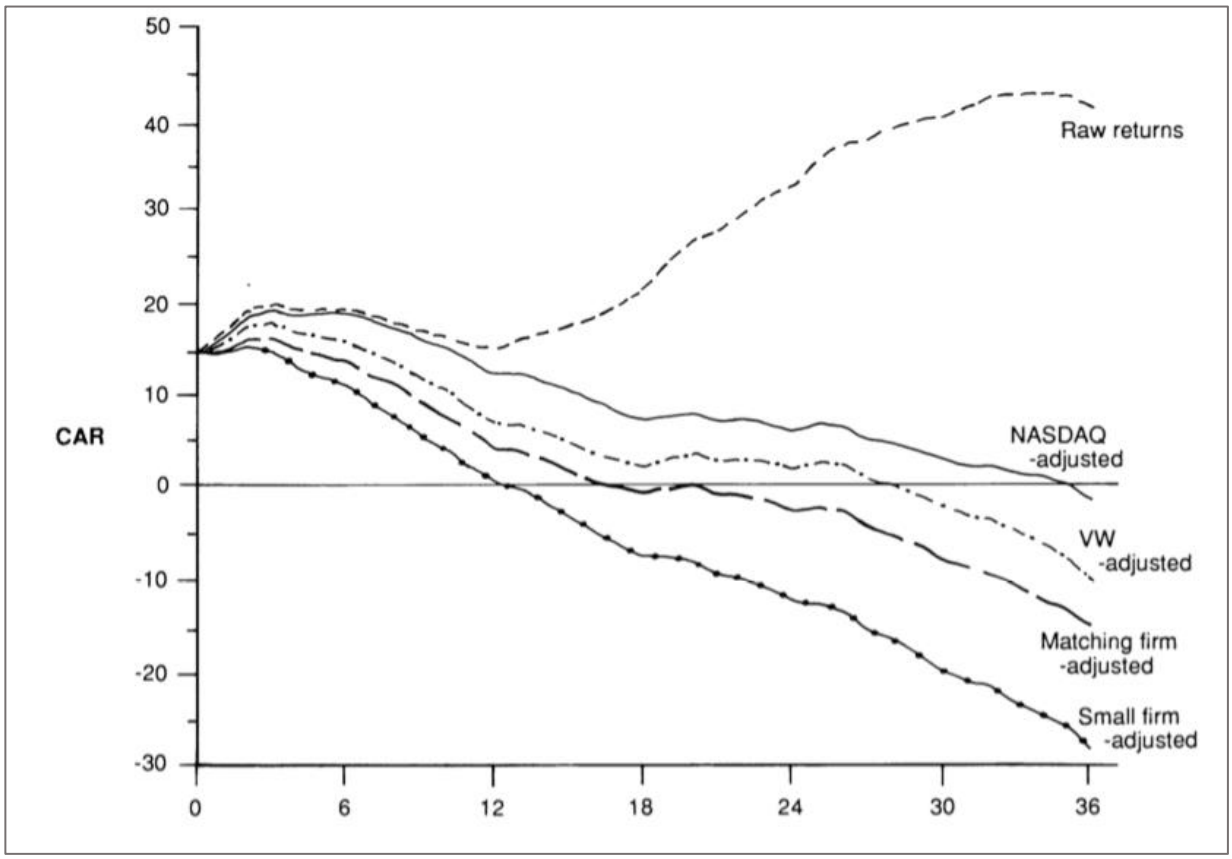
While underpricing is presumably considered as a short-run phenomenon, long-run performance operates on more extended time horizons. First part in this structure is the main concept of the projected research. Definition of this component is highly important, because it would allow to assess the results and would help to interpret them. Here I will try to present the most relevant and significant scientific articles and researches in order to elaborate on the

definition, measurements and outcomes of long-run IPO performance. Generally, there is a plenty literature documenting the long-run underperformance of the initial public offerings deals. Starting from the late 1980's academic researches observe how much would have the investor gained holding the stock in a portfolio. However, with the development of initial offerings markets and methodologies for the investigation of performance, there appeared academic articles proving the opposite. Moreover, I should add that the pioneers of such researches were mostly focused on the developed market of the United States as the information availability is higher and the whole market is bigger. However, this could cause specific biases connected to the market data and selection problem. That are the main reasons why I want to comprehensively observe the literature connected to the long-run performance of initial offerings.

One of the initial and most comprehensive researches in this area are Ritter and Loughran. Their papers "The New Issues Puzzle" (Ritter and Loughran, 1995) and "The Long-Run Performance of Initial Public Offerings" (Ritter, 1991) mainly argue and proof that IPOs in long-run do underperform. Hence, in this part I will elaborate on them. The paper by Ritter (1991) gives basic representation of one way to measure the performance. Generally, the study was aimed to analyze the sample of IPOs in terms of the prices of the stocks and how they behaved over the long-run period, specifically three years after IPO. The research problem and question were not clearly stated, but it is answering the general question of how the IPO stocks behave in long-run observation period. Mainly, examination of long-run performance for Ritter was interesting due to several reasons: practical implementation of results for investors, information asymmetry among deals, market opportunities for issuers or so called "windows of opportunity" and dependence of cost of external capital on the further returns. Concerning the methodology of the study, the author takes the sample of ~1500 IPO firms that are consequently analyzed on buy and hold returns in three years after the deal. Also, the author uses another measure for the returns – cumulative average adjusted returns. If the first measure is clear enough, the second needs some more explanation. Adjusted returns are adjusted basically on the benchmarks, meaning that from the raw return of a stock the author subtracts the return of corresponding benchmark (weighted values of stock exchange indexes, e.g., NYSE), then the weighted average by number of stocks is calculated. Moving to the results section, by this research the author investigates the phenomena of three-year underperformance of initial public offerings. "A strategy of investing in IPOs at the end of the first day of public trading and holding them for three years would have left the investor with only 83 cents relative to each dollar from investing in a group of matching firms listed on the stock exchange…" – the citation of the main results of the author (Ritter, 1991). Moreover, the author tries to elaborate on why this phenomenon happens. Several assumptions such as information asymmetry & investors' biases were stated. These reasons will be elaborated more

clearly in the next part concerning the factors. For better visualization and understanding of IPOs performance we can observe the following chart 2:

Figure 2 Different types of performances of IPOs



Source: [Ritter, 1991]

The chart 2 gives visual representation of underperformance by different return measures. The raw return could be misleading in this case since it does not include any comparison with peers or benchmark indexes.

The paper of both Ritter and Loughran (1995) is also raises the question of why do companies issuing equity produce such low returns for investors over the next five years? The research question wasn't clearly stated as in the previous paper, but it easily derived from the context of the paper. Do IPOs actually underperform in 5-year horizon and why it happens? The authors consider not only initial but also seasoned equity offerings. The logic of their methodology is similar to the previous one – examine and compare buy and hold returns of the issuers and non-issuers, adjusting and matching the companies and measures by benchmarks. Overall, the methodological process could be divided into three main procedures: first is comparing annual holding-period returns on issuing firms relative to non-issuing firms, second is regressions on monthly individual firm returns and the third is multiple regressions of monthly returns for portfolios of issuing and non-issuing firms (with the factors of market value of equity, book-to-market ratio, and whether a firm conducted one or more public equity issues within the previous

five years.). All three stages use t-statistics criterion for significance check. Speaking of the returns results of IPOs, the authors document that over the five years following an IPO, the average firm earned just 5% per year. An investor would have had to purchase an outstanding 44% more money in an IPO firm, compared to in a non-issuing company of the same size, to have the same wealth five years later. Moreover, the other result of "seasonality" matter from my point of view. This is the evidence of underperformance on volume dependence. In particular, "firms issuing during years when there is little issuing activity do not underperform much at all, whereas firms selling stock during high-volume periods severely underperform." (Ritter and Loughran, 1995), meaning that market activity and the volume of IPOs are basically could be one of the proxies of "goodness" of initial offering.

There is an extensive number of articles which evidence the underperformance outside the US market. Levis (1993) obtained the same results for the UK market. Using the similar methodological approach as Ritter (1991) and the 1980-1988 period of the sample, the author documents the underperformance of London based IPOs within the 36 months after going public. The paper by Alvarez & Gonzalez (2005) shows the 5-year underperformance on Spanish IPO market. It is worth mentioning that the pattern of substantial underperformance holds outside developed markets as well. Jenkinson & Ljungqvist (2001) provide the comprehensive summary of the situation of developing markets: Brazil, Chile, Finland and others, presenting the substantial underperformance of initial offerings. However, as it was stated previously, there is also a number of topics that argue in favor of the incorrectness of the results obtained by the researches. This is mainly due to the methodological approach, models in use, the measured performance type and the time horizon within returns are measured. However, the pattern of overperformance is primarily connected to the sponsorship presence, i.e., the companies with financing perform on average better than non-sponsored peers. This issue will be discussed in a further separate part.

While the previously mentioned studies evidence the substantial underperformance of initial offerings, there are a number of studies which argue that statement. The primary article was issued as the reply to the new issue puzzle made by Loughran & Ritter (1995). The article by Espen, Masulis, & Øyvind (2000) revisits the situation and analyzes the long-run performance of seasoned equity offerings. The authors doubt the methodological approach used by Loughran & Ritter (1995). Particularly, they state that "We conclude that the 'new issue puzzle' is explained by a failure of the matched-firm technique to provide a proper control for risk" and hence the presented previously methodology to compare issuers and non-issuing matched companies is a substantial methodological flaw. Instead, they suggest that higher turnover or liquidity caused by the issue could lower the returns obtained and that issuing companies have lower systematic risk as the leverage is decreased, decreasing the stocks' expected returns. Hence, the matched firms do

not overperform the issuers but the lower exposure to risk makes the returns be lower and if correctly adjusted for this, the issuers perform better within long-run. However, the important remark should be done concerning this study, it is analyzed mainly for seasoned public offerings, which is another type of issue. The issuance of initial and consequent shares is similar, but still there could be unobserved factors which could influence the performance. Hence, I suggest not to mix up these concepts and focus on the initial offerings, while the study presented is important to investigate in order to observe the arguments in favor of issuance' positive performance. The paper made by Blomkvist, Korkeamäki & Pettersson (2017) could be considered as extension of the "New issue puzzle" and the authors also argue in favor of initial offerings' positive performance. By introducing a new factor in the Fama-French model, so-called "quality minus junk", the authors control for "the time varying premium for high quality assets". In particular, this factor measures the period of issuance with high/low premiums for high quality stocks, i.e., for those with higher expectations, operating performance indicators and price. The results show that the initial offerings from the sample overperform market benchmarks by 0,625% per month. However, the important remark should be done, the presented factor naturally leads to selection bias if properly controlled and consequently the adverse selection process during high/low "quality minus junk" time period. It means that the firms which are considered as poor investment on an IPO stage could still go public and offer positive NPV projects with lower cost of capital.

The methodological approach is particularly important in this context as it allows to choose the best model for IPO's performance estimation and argue in favor of validity of the results. I summarize that there are two general methodological approaches to measure the performance of the company: operating and market performance. The first investigates the companies' operating performance which is based on accounting proxies and depicts the situation inside the company with the consideration of influence of other factors. This proxy of operating performance is used by the researches to examine the long-run performance not only after an IPO deal but the other events as well, e.g., Degeorge & Zeckhauser (1993). The second approach of stock return, or as it is also called market performance uses market perception in a form of prices. More precisely, it uses special returns, e.g., abnormal in order to compare the effectiveness/performance of the company within a period. In further chapters I will elaborate more on the justification of chosen methodological approach.

Concluding this part would like to state that the presented researches are mainly significant for the basic understanding of the concept of long-run performance. They give the base in terms of measurements and methodology of long-run returns and performance which is crucial for understanding. Moreover, there exist several opposing evidences of an initial offerings' performance, the researches indicate their underperformance as well as their performance. As it

was discussed, these could be due to differences in samples, methodological approaches, time horizons or controlled factors. Therefore, the deeper understanding of the research process is needed, how to choose an appropriate methodology, time horizons and sample in order to get meaningful and correct results of this study. All these points will be presented in further parts.

1.3. Factors influencing IPO performance

This section will introduce main approaches and scientific researches which identify general factors that influence initial offerings' performance. This is particularly done in order to structure these factors for further analysis as one of the research questions is about the determinants of the success of the public offerings. The literature review in this part would significantly contribute in the analytical part as it would identify the factors of initial public offerings' either operating or market performance.

There is a substantial number of approaches and analytically backed opinions about why the IPOs do underperform in long-run periods. Following one of the research pioneers in this field Ritter (1991), the author identifies several patterns of the IPOs performances' behavior. First is so-called "hot issue market" documented also by Ibbotson and Jaffe (1975). "Hot issues usually refer to particular stock issues that have risen from their offering prices to higher-than-average premia in the aftermarket" (Ibbotson and Jaffe, 1975). This type of market condition is characterized by "abnormally high average first month performance" of new issues (Ibbotson and Jaffe, 1975). Generally, it is defined also by early oversubscription on the initial offering which, in turn, leaves space for further short-run speculation. It is generally assumed that this factor could contribute to the long-run underperformance of initial offerings. The authors propose two different scenarios of the aftermarket performance depending on the issue market conditions, resulting in their one and two-months performance after the issue. The authors suggest that the second scenario of "cold" issue conditions could eventually benefit for the companies – "Therefore our results suggest that companies should issue in cold issue periods" (Ibbotson and Jaffe, 1975). However, there are certain limitations of inverse relationship of immediate aftermarket return with return on the first month, when it holds the company is better off with the "hot" market conditions.

This leads us to another phenomena of IPO underperformance described by Ritter (1991) – investors' overoptimism. This is particularly characterized by irrational beliefs of investors in the glamorous IPOs coming from optimistic and exalted prospectuses, for example from tech industry which is believed to be a fast-growing and perspective. Number of studies have documented the systematic overoptimism about IPOs' pricing, operational or market performance. For example, Cogliati, Paleari, and Vismara (2011) conclude that IPO firms are valued at extremely high and overvalued growth rates which on ex-ante analysis typically do not reflect the

real state of affairs. Hence, forecasts based on the initial offerings' prospectuses are generally overstated. Moreover, there are studies which document negative relation between the demand or oversubscription of investors and long-run performance of IPOs (Chan, 2014). The next interesting pattern observed by Ritter is IPOs' volume, specifically he identifies negative association between the volume and the investors' sentiment (measured by discounts offered on the price by closed-end mutual funds). By volume here it is meant the overall number or proceeds from IPO at this moment, i.e., the market conditions. There is also could be a matter of firms' reaction to high market volume, hence they want the IPO deal because their peers also do initial offerings. The factor of firms' age plays significant role as well, documenting the younger firms mainly with higher market-to-book value underperforming the size and industry matched companies with lower market-to-book value. Moreover, in the study of Ritter (1991) includes the industry factor, but this is done in order to control and ensure industry adjustments, for instance, the oil & gas industry suffered in this time period of observed IPOs, hence the regression coefficient was significantly negative.

The noticeable research in this field contributing the examination of factors influencing the IPO long-run performance is done by Miller (2000). The author not only explains evident and proved substantial underperformance of IPOs but also presents the theory of divergence of investors' opinions which is high on the raising stages and declines over time. More precisely, the divergence of opinions is the uncertainty of investors about the fair price of the asset, being estimated as present value of all future cash flows. Then, the author states that "IPOs typically having a large divergence of opinion, which in itself tends to raise the price and to lower the rate of return. Divergence of opinion often declines in the years following an initial public offering. When a company is new, there is often great uncertainty about its future. Some investors will be much more optimistic than others. These optimistic investors will set the price" (Miller, 2000). The tendency is that the opinions about the company and its operating performance are starting to converge as there appears more information about operating performance trends, it is easier to forecast the figures, and investors tend to shrink their estimates about fair value of the company. The main issue documented by the author is that one of the measures of this divergence of opinions could be measure of uncertainty, which, in turn, is quite complicated to obtain. In addition to the theory of divergent opinions, the author also suggests that short selling could affect the performance of the company, i.e., stock price. It is suggested that the effect could be rather insignificant and limited due to the process of borrowing, i.e., "the stock of initial public offerings cannot be sold short (except by the underwriters) at the start of trading. The reason is that the short selling process requires borrowing the certificates in order to make delivery. However, it takes a while for the underwriter to actually distribute the shares" (Miller, 2000). Another noticeable

factor the author states is the seasoning, again, meaning the estimate of uncertainty accompanied with lack trading history. This is tightly connected to the fact of risk estimation, the new company could not provide investors the evidence of operating performance, hence the greater variability of price estimates occurs, but with time going on, the investors adjust their opinions about the present value of future cash flows judging according on the operating performance. Hence, the described earlier phenomena of divergence of opinions starts to shrink and investors equal their estimates of risk or beta and about stocks' liquidity in some sense. The author states that this decreasing uncertainty should decrease the price of a stock, unlike the capital asset pricing model states, with declined volatility, beta and risk estimations, the price of a stock should go up. "It might be noted that the capital asset pricing model would predict that the decline in beta with time would be accompanied by an increase in price, which would cause initial public offerings to outperform the market, which is the opposite to what is observed" (Miller, 2000). Moreover, this research presents significant determinants of IPO long-run performance, which are also based on the study of Ritter (1991) but with some extension to his work. These determinants are volatility, size, firms' age, underwriter's reputation and industry.

The size of a company is stated as one of the factors influencing underperformance, the theory which was proven by many researches is that the firms with lower size would be the object of speculative intentions with greater uncertainty and greater divergence of opinions. Usually, the authors like Ritter use the sales as the proxy of size. Hence, the smaller the firm the greater its underperformance in the long run. Firms' age could also be a measure of underlying risk and the studies of Miller (2000) and Ritter (1991) provided a clear evidence of the long-run underperformance of younger firms or startups with statistically significant results. For example, Ritter (1991) suggests that the wealth relative – the measure of relative to matched firm performance, increases with the increase of the firms' age, reaching peak for firms over 20 years old prior to an initial offering. There are also studies which document the evidence of underwriters' reputation factor which influences IPO performance. For example, Carter, Dark, & Singh, (1998) examine the relationship of underwriter's quality and long-run performance of stocks. Repeatedly, the information available to the market and investors plays role here, and underwriter being one of the major intermediaries for receiving and conveying this information.

Concerning other studies about IPO performance factors, there is a number of studies that examine the influence of IPOs' acquisition activity. Brau, Couch, and Sutton (2012) in their paper under the topic "The Desire to Acquire and IPO Long-Run Underperformance" investigate the influence of acquisition activity on long-run performance of IPOs. The main reason why I include this paper in the review and consider it as an important for my research is that this study confirms the hypothesis about influence of takeover activity on the long-run performance of the company,

being one of the suggested factors for analysis. More precisely, the authors analyze vast amount of IPOs deals, i.e., 3,547 within long time span of 18 years, and identify that the companies which are engaged in vigorous acquisition activity within the first year of IPO have significant underperformance in the following three years in terms of excess returns compared to the similar non-acquisition companies (Brau, Couch, and Sutton, 2012). For the purpose of the analysis the factor of acquisition was measured as a dummy variable, hence if the firm took over at least one company for the first year of the IPO, it was considered as acquirer.

While considering the literature connected to the topic of long-run performance of initial offerings, I identified one factor to which substantial number of researches are devoted. The so-called earnings management or income smoothing could influence the performance. The process of the deals connected to the public capital raising requires significant efforts in terms of preparation, and the stage of planning takes usually from three to five years. Hence, it is the interest of the company to adjust the earnings in order to depict better position and in result benefit from higher price estimation. The phenomenon is primarily based on the accounting figures which company shows, while adjustments are primarily connected to management decisions in terms of accounting policies. However, the factor of earnings management needed to be calculated separately and possibly will not be considered in this study. The study of Premti & Smith (2020) evidence the hypothesis of on average higher engagement in earnings management techniques while preparing for the IPO deal. Based on discretionary accruals – accounting estimation of earnings management, the authors also evidence that the firms with intentions to have future public capital raising and that are with higher leverage and/or financed by venture capital funds are less likely to be engaged in such manipulations. However, the last finding is doubt by the Carvalhoa, Pinheirob & Sampaio (2020). The authors divided the whole process of when the possible earnings management could appear into several stages: pre-IPO, IPO, lock-up and post-lock-up and evidence that venture capital-backed firms tend to adjust earnings more than average on the first, pre-IPO stage. In the context of aftermarket performance, the research by Kao, Wu & Yang (2009) proves the hypothesis about negative association between long-run performance and earnings management engagement.

The important consideration of other type of deals could be considered as well. The study by Brau, Couch & Sutton (2004) investigates the performance of public companies after merger and acquisition deals. This is called “desire to acquire” and the authors evidence substantial underperformance of firms that do M&A deals compared to those which do not. “The mean 3-year style-adjusted abnormal return is -15.6% for acquirers and 5.9% for nonacquirers” (Brau, Couch & Sutton, 2004).

To sum up the factors' analysis, there are various types of indicators of potential IPO performance: operating/accounting indicators, market conditions, intermediaries' factors and basic properties of a company such as age or size. Since my topic is devoted to the financed initial offerings, I will elaborate more clearly of backing factor in the next section after which the summary of performance factors will be presented in the Table 2.

1.4. Financed IPOs & growth capital-backed IPOs

The presented chapter of literature review is considered as the most relevant and important in terms of coherence with the presented thesis. Here I will observe and analyze the prior studies and researches that are particularly connected to different types of financing. Furthermore, in this part I am going to critically evaluate the basic underlying paper of Ritter (2015) which presents the new concept of specifically financed initial public offerings. This is particularly important in terms of my paper in order to observe the influence of financing factor on the performance. Moreover, it will help me to critically evaluate other important determinants of initial offerings performance.

Generally, there identified two types of equity's financial sponsorship of initial public offerings. All of them are widely described and their performance is examined. These two types are: venture capital financing and private equity financing. It is widely argued in the literature that the presence of financial sponsor arises the issue of so-called agency theory. This results in differential of goals stated by the owners and performed by managers of the companies, i.e., controversies arise. This concept would generally result in costs derived from such situation and there is a plenty of academic researches which are aimed to investigate the solutions of reduction this agency costs. The PE sponsorship is not an exception in such sense due to the fact that the private equity fund frequently becomes a controlling owner of the company with the remained management team. While the management team is often does not own the firms' controlling stakes, they could behave in an opportunistic manner. The study by Jensen & Meckling (1976) argue in favor of the situation when the managers, being not the controlling party, do not carry the full amount of costs and hence could introduce additional costs behaving in a riskier way.

However, there are certain benefits appear from the sponsorship and the literature suggests that they outweigh the drawbacks in the context of aftermarket performance of initial public offering deals. The study of private equity-backed IPOs by Levis (2011) examines aftermarket performance of such type of firms and compares its performance with the venture capital sponsored companies on London Stock Exchange. The results display that the firms with private equity financing are on average larger in terms of market capitalization and operating indicators and they result in lower underpricing while going public compared to VC-backed and firms with

no sponsorship. Moreover, the aftermarket performance of PE backed firms demonstrates higher positive abnormal returns than venture capital-backed or non-backed firms. The author also argues that one of underlying reasons of such overperformance is that the structure of the sponsor's ownership remains after company goes public, hence the expertise and knowledge obtained during private tenure remains. The author suggests that the additional value creation in PE backed companies is derived from better and more experienced management team. It is also widely argued in the literature that the management of sponsored firms has tight conditions, and all of their actions are aimed to shareholders' value adding process as there are strict controlling initiatives imposed by the owners. The other extensive argument proposed to play in favor of PE-backed firms is the level of leverage. It is generally accepted and assumed that the high leverage could result in higher value creation to the shareholders. The article by Jensen (1986) argues that the leverage could diminish the agency costs incurred by the backed companies just due to the lower amount of place for free and reckless actions from the management point of view. Hence, managers take into account the level of debt which should be redeemed or maintained. It is worth noticing that there are two sides of the coin, despite all the agency problem mitigations' the debtholders also have their own interests, and from the corporate finance we know that the optimal amount should be maintained in order not to result in distress situation. I suggest that the level of leverage should be also considered in the context of initial public offerings' performance. That is interesting and controversial point because some of the articles argue in favor of positive relation of aftermarket performance to the level of leverage, while some do not. The study by Korteweg (2010) suggest negative association between the stocks' returns and optimal leverage structure. While the research by Hou & Robinson (2006) document the opposite results and the leverage has a positive association with stock returns. However, Gomes & Schmid (2010) argue that the association of these two could be a more complex by nature and could be dependent on various aspects. "We find that in general the link between leverage and stock returns is more complex than the static textbook suggests and will usually depend on the investment opportunities available to the firm. In the presence of financial market imperfections leverage and investment are generally correlated so that highly levered firms are also mature firms with relatively more (safe) book assets and fewer (risky) growth opportunities" (Gomes & Schmid, 2010). Hence, the factor of leverage should be tackled wisely while observing its influence on the returns.

As it was shown on the literature, private equity firms perform better in long-run and demonstrate higher abnormal returns. There exists the second type of external financing which is venture capital. Basically, this is a subset of private equity financing, and the generally perceived distinction from PE is the financing of early-stage startups which probably will become very

successful during the initial offering or buyout, generating high returns for venture capital fund. The paper by Metrick and Yasuda (2011) outlines several distinct features of venture capital:

1. A VC is a financial intermediary, meaning that it takes investors' capital and invests it directly in portfolio companies.
2. A VC invests only in private companies.
3. A VC takes an active role in monitoring and helping the companies in its portfolio.
4. A VC's primary goal is to maximize the financial return by exiting through a sale or an IPO.
5. A VC invests to fund the internal growth of companies.

Hence, the common case for VC investment is to find small business which has the substantial growth potential and allocate funds or expertise to them. The allocation is made with the higher risk-taking positions, meanings that a VC funds typically tradeoff for the higher risk of a startup and, hence in a success cases gain higher returns.

This type of equity financing is a hot topic nowadays, and there is plenty of studies which investigate the relationship between venture capital investments and long-run performance of initial offerings. The study by Brav & Gompers (1997) examines 934 venture-backed and 3,407 non-venture-backed US companies. Using the equally weighted buy-and-hold abnormal returns, the authors evidence significant outperformance of venture capital-backed firms compared to non-backed, resulting in approximately 44,6% on average for VC-backed and 22,5% for non-backed IPO performance within the 5-year period after the capital raising. The study by Guo, Jiang & Mai (2015) performed on Chinese market with the operating performance measures shows similar results in terms of outperformance. According to them, the major operating indicators, i.e., return on equity, return on assets and Tobin's Q performed on average better for VC-backed companies.

The following table is created for better summarizing the factors of IPO performance and their influence on it:

Table 2 Summary of IPO performance factors

Author	Factor in use	Relationship to IPO performance
Ibbotson and Jaffe (1975); J. Ritter (1991)	"Hot issue market"	Negative
Ritter (1991); Cogliati, Paleari, and Vismara (2011)	Oversubscription/ Investors' optimism	Negative
Ritter (1991)	Size of a company	Positive

Ritter (1991)	Discounts offered to price/overall issue volume around IPO	Negative
Miller (2000); Ritter (1991)	Age before an IPO/Maturity	Positive
Hou & Robinson (2006); Korteweg (2010); Gomes & Schmid (2010)	Leverage	Not obvious
Ritter (2015); Carter, Dark, & Singh (1998)	Underwriters' reputation (top-tier investment banks)	Positive
Brau, Couch, and Sutton (2012)	Subsequent acquisition activity	Negative
Brav & Gompers (1997); Guo, Jiang & Mai (2015); Levis (2011)	Underwriter VC or PE financing	Positive
Carvalhoa, Pinheirob & Sampaio (2020); Premti & Smith (2020)	Earnings management	Negative
Hansen, Bartholdy & Jørgensen (2010)	Operating liquidity	Positive on operating performance
Brau, Couch & Sutton (2004)	M&A activity	Negative

1.5. Hypotheses formulation

Following the critical literature review and the review of the general factors that could influence the initial offering aftermarket performance, I suggest the formulation of several hypotheses that are particularly useful and will help to answer the main research question. The first and the main hypothesis concerns the issue of growth capital-backed initial offerings. Following the literature under investigation and particularly the article of Ritter (2015) I can reasonably assume that these firms actually perform better and have positive abnormal returns, i.e., on three-year time horizon. The further hypotheses are mainly connected to the factors under investigation.

The stated hypotheses are the following:

H1: *Growth capital-backed companies have positive and statistically different from zero three-year benchmark-adjusted buy-and-hold abnormal returns.* This hypothesis is derived and based on the paper by Ritter (2015). There he reports substantial benchmark and style-adjusted three-year buy-and-hold abnormal returns of approximately 14%. Hence, this hypothesis is made according to his results. Along with it there are no more evidence of such significant aftermarket overperformance, hence the confirmation or rejection of this hypothesis will benefit to academic literature. The measurement of this hypothesis will be based on mean value of the portfolio as suggested by previous researches (Ritter, 1991).

H2: *Leverage would have positive relation to the long-run aftermarket performance.* Despite the arguments around this factor, I suggest stating this hypothesis due to the evidence of more comprehensive association between leverage and aftermarket performance made by Gomes & Schmid (2010). The authors argue in favor of more complex concept of connection, hence positive relation is generally connected to more mature firms with extended investment opportunities and subsequently they are more leveraged. Therefore, I would suggest that the specifics of growth capital-backed companies are also connected to the investment opportunities, mainly in tangible assets growth, hence leverage could be a significant positive contribution in those growth. That is why I suppose positive association. The measurement of this hypothesis will be based on the percent of debt capital in equity capital, i.e., the debt-to-equity ratio.

H3: *The higher proportion of issued shares relative to shares outstanding would have negative influence on long-run aftermarket performance.* The volume of an issue is a new factor which is presented in the research. The issuance volume mainly described in the literature is connected to market environment, i.e., how many IPO deals are on the market and what are gross proceeds. However, the number of shares issued by the company is a new concept and it could estimate the investors' sentiment towards fraction offered on the market relative to the shares outstanding. I suggest these hypotheses are relevant in terms of the presented analysis and could help to comprehensively analyze the topic of growth capital-backed initial offerings.

H4: *The presence of higher operating liquidity in a company during initial offering positively influences long-run aftermarket performance.* Previous researches have mainly identified the influence of stocks' liquidity, i.e., what is the turnover of the specific stock on market, what are demand and supply. Hence, considering this as a risk factor which could potentially lower the projected returns (Eckbo & Norli, 2005). However, since my idea is to observe the influence of operating indicators, I will use the liquidity in terms of current ratio at the moment of initial offering. The previous research concerning this issue made by Hansen et al. (2010) suggests positive association to post-IPO operating performance measured as return on assets. The liquidity in this study was measured as quick ratio at the moment of initial offering.

Since there is no clear evidence of influence on the aftermarket performance, I think similar direction could be hypothesized. In the presented research, the measurement of operating liquidity will be based on current ratio of the company at the moment of initial offering. All the presented hypotheses are constructed for three-year aftermarket performance. This is considered as a long-run common threshold in previous literature (Ritter, 1991; Loughran & Ritter, 1995; Brav, 2000). For other variables and factors which are introduced in this research there is no prior evidence of the possible directions of influence and the hypotheses' formulation could not be justified by sources. Moreover, I suggest those hypotheses are checked by all the models that will be presented. More precisely, I am going to construct linear OLS and non-linear logit models if appropriate and by these means check the hypotheses.

In the following text I want also to elaborate more on academic side of the research, how it is considered and what research type it is. Research design of the study implies the solid and feasible linkage of the research questions stated and the methods of the analysis used in order to get reliable results. In this section I will elaborate on these issues and linkages with the proper justification of the proposed points. The part will consist of general description of the study in terms of research strategy and design, followed by the methodological part which includes explanation of the used models with the justification of their choice, description of data and sample used, and the results obtained. Generally, the approach of this study is deductive as there is hypothesis formulation derived from the comprehensive literature analysis. Hence, there is a bottom-up type of research based on the confirmation or rejection of the existing theory, rather than creating new theoretical concepts. Moreover, the data for hypotheses testing is used. However, I suggest that in the end the results could be applied for exactly description of theoretical concepts. Therefore, there might be a mix of the strategies in use. First, I suggest that this study is going to be explanatory in general as I want to understand the phenomenon of long-run performance of a specifically financed types of companies and what factors could possibly influence it. The reason for it is that the thesis research will attempt to derive conclusions from the established relationships between performance and projected factors. Concerning the specific research strategy, I suggest that this is going to be relationship one with different time horizons and the panel data sample will be used. Hence, it is a longitudinal study, variables measured over time as I am going to research long-run performance. It assumes measurement over long period of time (3 years). Particularly, the performance estimation part of the study implies usage of returns over the specific time period. While the factors' influence model implies rather cross section analysis with variables that vary not over time but over companies.

The empirical research will be divided into two major parts: the long-run performance estimation and investigation of the "performance factors" and their influence on the performance.

This is done in accordance with the research questions stated above. On the basis of literature review and analysis, I propose the chosen methodological approaches are suitable for this study with certain limitations. Thereafter, in both long-run performance and factors' estimation of a methodology chapter, I will elaborate more precisely on the alternative instruments/approaches with the justification in favor of chosen ones. In this part I would also like to discuss several important issues concerning the main constructs of this study. I suggest that the main concept of the research is long-run performance, i.e., the measure of how companies involved in these deals perform in long-run and what value do they create for shareholders within the proposed time span. The operationalization procedure of this concept is extensively described in the prior literature, since there are many approaches to measure the concept, I will elaborate more on it in the methodology section. The next vital point is the models I am going to construct in order to observe the relationship between returns and various factors that could influence it. In prior part of literature analysis, I described the researches that investigated the influence of various operational, financing and innate characteristics of companies on their performance in long and short run. After the literature analysis, I will think out the final pool of factors that could be used for the model construction.

Summarizing the first theoretical chapter, the comprehensive analysis was made following top-down approach from the general issues of initial offerings to the object of my research – growth capital-backed companies. I have considered main theoretical studies in order to define the main concepts of the research and give different views and elaborations on the issues concerning initial offerings. Moreover, according to the literature analyzed four hypotheses were stated and justified. The main research peculiarities such as type, research design and further division were elaborated as well.

CHAPTER 2. EMPIRICAL RESEARCH OF GROWTH CAPITAL-BACKED IPOS' LONG-RUN PERFORMANCE AND INFLUENCE OF THE FACTORS

2.1. Measurement of long-run IPO performance

In this chapter I will describe the first analytical part of my research. As it was stated previously, the main concern here is to evaluate long-run performance of initial offerings of two sets of companies: growth capital-backed and what I state as "others". The chapter will include general explanation of how to measure the performance, the critical review and further justification of the chosen methodology/techniques of analysis, the description of companies with which the observed sample is going to be compared.

First, I need to start with the general approach of long-run initial offering measurement. There are many ways of measuring such concept, as it was described in the theoretical foundation of long-run performance, there are two main methodologies to quantitatively indicate the performance: using accounting or operating proxies or using market stock proxies. The studies described formerly mainly use the second methodology to observe the performance of the company. I suggest that the second approach is much more relevant and depicts the full information due to several reasons: the timing, the investors' relevance and the fullness of information. The first issue concerns the fact that the operating performance generally is past looking approach as the statements are published with lags, while the prices are investors' expectations of the future earnings. It is connected to the third argument that according to market efficiency theory, prices depict the full information available. Hence, the investors' relevance is higher when the stock market approach is used. Moreover, a major part of studies uses exactly this approach. That are the primary reasons why I suggest using market performance as the proxy for long-run performance.

The raw returns of stocks' prices mainly considered as not appropriate due to the nature of market comparison, meaning that one needs to compare companies' performance with the market, or so-called benchmark. Hence, if the company outperforms market/index/benchmark, it could be considered as successful, leading to the concept of abnormal returns – the excess return or the difference between real and "normal" returns. The "normal" return, again, represents the expected return, or the return of market or a benchmark (MacKinlay, 1997). It is commonly used in event studies as it could capture the influence of a specific event on the market (e.g., merger, announcements and others) on the stock's price (MacKinlay, 1997). The formula for abnormal returns is the following:

$$AR_{it} = R_{it} - E_t \qquad (1)$$

where ARt – is an abnormal return of company i for period t, Rt – is the raw or actual return of company i for period t, and Et – is the "normal" or expected return for period t. I consider the concept of abnormal returns as applicable to this specific research due to several facts, the first is that all the prior studies in one or another way using modified concept of excess returns in order to capture not only the performance of IPO companies, but also performance after some events. Secondly, this measure implies the stocks prices' efficiency, hence, they reflect all the available to public information (Fama, 1970). In turn, this would allow to observe anomalies on the market as the theory would be able to capture everything, there would not be any inefficiencies.

As it was stated previously, the prior pioneer studies in this field use modifications of abnormal return approach. Moreover, there are continuous arguments about those approaches as all of them have the drawbacks and benefits. These main approaches or measures are: BHAR, CAR, CCAR and Fama-French three-factor model. For example, one of the most popular and meritorious professors in this field Ritter (1991) uses cumulative abnormal returns (CAR) and buy-and-hold abnormal returns (BHAR) methodologies in his study to document long-run underperformance of IPO companies. For the calculation of CAR, the author uses portfolio averaged and benchmark adjusted abnormal returns:

$$AR_t = \frac{1}{n}\sum_{i=1}^{n} AR_{it} \quad (2)$$

where ARt – is the averaged abnormal returns of n companies' portfolio over the t period, and ARit – is the abnormal return for a company i in the period t. The formula given for the CAR is the following:

$$\mathrm{CAR}_{t1,t2} = \sum_{\mathrm{t}\,=\,\mathrm{t1}}^{\mathrm{t2}} AR_t \quad (3)$$

where t1 – is the beginning of the observed event, and t2 – is the end of the observed event. This approach could be considered as useful in shorter time span analyses. The next modification or approach used in Ritter's paper is BHAR. It is used for defining longer time span performances of companies, usually over three or five years. The composition of this approach is the following:

$$BHAR_{t1,\mathrm{t2}} = R - R_{\mathrm{benchmark}} = \prod_{\mathrm{t=t1}}^{\mathrm{t2}}(1 + R_{it}) - \prod_{\mathrm{t=t1}}^{\mathrm{t2}}(1 + R_{\mathrm{bench,t}}) \quad (4)$$

where t1 – is the beginning of the observed event, and t2 – is the end of the observed event, R_{it} - return of company I for the period t, Rbench,t – is the return of a benchmark for the period t, R and Rbenchmark – are the compounded over the t periods returns of company and a benchmark relatively. This approach is called benchmark adjusted as it takes abnormal returns of a company

over the benchmark. The important extension could be considered – so-called style-adjusted or matched firms adjusted BHAR measures. This approach is based on another benchmark calculation, basically instead of using the benchmark index over which the abnormal returns are calculated, there is a pool of matched companies introduced and over their returns the abnormal portion is calculated. The matched companies are chosen according to size (i.e., market capitalization) and book-to-market ratio, hence introducing companies with similar assumed returns. However, I suggest this approach could be misleading in some sense due to industry specifics, hence the matched firms could be chosen incorrectly. Moreover, it is quite complicated to find the matched companies for my sample as they should satisfy many criteria and it could be time consuming in terms of this paper.

In the study of Ritter (1991), the author uses division of time according to which the analyses are applied. The first is so called "initial" – short-term performance of the new stock, usually one or several days after offering, the method of cumulative abnormal returns is applied. While BHAR instrument usually uses monthly returns in longer time horizons in order to investigate the performance against the benchmark. The main feature of this instrument is the compounding application. Hence, many authors argue in favor of CAR estimation, because it eliminates compounding and gives not as big estimation errors, hence it could be not an appropriate measure of long-run performance of stocks (Fama, 1998). Moreover, for example, the research of Dutta, Knif, Kolari & Pynnonen (2018) outline other several problems documented as well in prior researches, most of them is connected to the statistical inferences that could be made out of this approach. These issues are strong positive skewness and that the distribution usually eliminates zero-mean assumption and is more similar not to the normal but to the log-normal shape (Mitchell and Stafford, 2000). However, considering all the disadvantages of BHAR methodology over CAR, it is more widely used approach due to the fact of summation of simple returns, while the n months return is the product of monthly returns. Here I should also clarify one particularly important point of BHAR and CAR relationship. From a statistical point of view, these approaches measure the same thing. Barber & Lyon (1997) say "cumulative abnormal returns are a biased predictor of long-run buy- and-hold abnormal returns. Consequently, on conceptual grounds, we favor the use of buy-and-hold abnormal returns in tests designed to detect long-run abnormal stock returns. We refer to this problem as measurement bias". Moreover, the authors tested the usage of CAR as one of the estimations influencing BHAR, i.e., they came up with the regression of BHAR as the dependent variable and CAR as independent. This resulted in providing the evidence of CAR being the biased estimate of BHAR.

One of the solutions to the problem of BHAR was proposed by Fama (1998), the methodology under the name Calendar Time Abnormal Returns (CTAR). This instrument implies

the usage of classic regression three-factor Fama-French model of parameter estimation. The model is the following:

$$R_t - R_{f,t} = \alpha + \beta_1 (R_{m,t} - R_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_t \quad (5)$$

where, R_t – is the return of a selected portfolio for the period t, $R_{f,t}$ – is the risk-free rate for the period t, $R_{m,t}$ – is the market index return for the period t, SMB_t – is the so-called size premium or the difference in returns of small and big companies for the period t, HML_t – is the value premium or the difference of returns of value and growth companies, determined by the book-to-market ratio (value – higher metrics of book-to-market or undervalued, growth – lower metrics of book-to-market), β_1, β_2, β_3 – basically are the coefficients of the regression. β_1 measures the systematic risk of a stock (form CAPM), β_2 measures size premium, and β_3 measures value premium, and α – is the coefficient which measures estimated average excess return of the portfolio, also called Jensen's alpha. Despite the fact that this calendar time approach resolves the issues stated before and has a tendency to eliminate cross-correlation of the observed portfolio, it has its own disadvantages as well. Dutta, Knif, Kolari & Pynnonen, 2018 state that the biasing effect of this model is determined by the fact of each period's equal weighting, hence not accounting for the rebalancing in terms of activity or events along the portfolio. Moreover, this approach specifically measures the average excess return of the portfolio, while my research assumes obtaining results for each case in order to then consider the sample by group with benchmark adjustment and regress the obtained variables to other factors. The benchmark adjustment is particularly important in terms of catching the excess returns over the market, the methodology of abnormal returns implies this procedure. However, the number of researches use matching firm adjustments. This approach implies using so-called style-adjusted buy-and-hold abnormal returns. The companies for matching are chosen according to the market-to-book ratio. This methodology, in turn induces several doubts of choosing the matching firms, i.e., how the other factors are taken into account in this case (for example industry). My proposition for this part is to find the peers for the presented companies in terms of size and industry and calculate their abnormal returns in order to compare the results with growth capital-backed companies.

Thus, in the presented research I suggest using the BHAR proxy for the long-run aftermarket performance as the literature suggests that this could be the best-known approach considering all the possible drawbacks. Moreover, I suggest calculating the cumulative abnormal returns performance measure as well, i.e., for the first and for the first three days after the initial offering deal. This would allow to estimate the short-term performance of growth capital-backed IPOs and could be used as one of the factors in the following research part. Therefore, for long- and short-term performance measurements I will use average abnormal returns of the portfolio in

order to see the results, i.e., the descriptive statistics of portfolio's abnormal returns will give the results needed.

2.2. Estimation of factors influencing the performance

The following part will include the models I am going to test. The underlying idea of the second part in methodology section is to check which factors influence the long-run aftermarket performance of the growth capital-backed companies. In order to check the assumptions and the stated hypotheses, I suggest using the multiple linear regression approach in order to check the relationship between factors and the abnormal returns. This approach is widespread in the literature, and the mentioned above researches used the same technique to observe the relationship. The concern here could be endogeneity problem. I admit that there could be some variables that are not taken into account; however, my variable choice is primarily caused by the literature analysis and by the data availability.

Therefore, I suggest using several multiple regressions of the common type:

$$\boldsymbol{BHAR_i} = a_i + \beta_1 CAR_i + \beta_2 ln(1 + AGE_i) + \beta_3 SIZE_i + \beta_4 VOL_i + \beta_5 LEVERAGE_i + \beta_6 ROA_i + \beta_7 LIQUIDITY_i + \beta_8 M/B_i + \beta_9 IPO\ YEAR\ dummy + \beta_{10} Industry\ dummy + \varepsilon_i \quad (6)$$

This regression is considered as the main one, it implies usage of BHARs as the dependent variables, it includes control variables such as age and size. These variables are assumed to be control as in prior literature, they control for size of an issuer and the age prior to IPO (Loughran & Ritter, 2004; Ritter, 1991). The size is measured by total assets on the moment of the deal, due to high absolute values and high variance/volatility I suggest using the natural logarithm in this case as well as for the age of an issuer. These variables would control for the differences among the companies. The IPO year dummy variable is introduced because of the market crisis and distress during the years of 2007-2009, hence it is necessary in order to control for such subperiod. I suggest this approach for the subperiod control could be useful and correct as the paper by Ritter (1991) does the similar control for other subperiod. The CAR variable is used as an independent in order to observe the influence of short-term performance on the long-term ones. The prior researches indicated that there should be positive relation and by nature these variables measure one thing. I suggest using logarithmic transformation in this case because of the scale of those estimations. The other independent variables mostly represent the operating indicators of the companies, i.e., leverage – is the % of total debt in total equity at the moment of IPO, liquidity – is the current ratio (relation of current assets to current liabilities) at the moment of IPO, ROA–

returns on assets of the company. Return on assets at the time of IPO is chosen as an independent variable because I assume it could be an important indicator in terms of growth capital-backed companies specifics. As we have discovered, these companies by definition should have projected investments in tangible assets, while return on assets shows how efficiently assets are managed and how company utilizes the resources. I assume there could be a strong influence of this factor on the performance of growth capital-backed companies. The volume variable represents the issue size of the initial offering relative to the shares outstanding. I suggest that the absolute value is rather misleading in terms of difference, i.e., the number of shares offered could vary from one company to another. Hence, I suggest usage the percent of shares issued to the whole number of shares outstanding; this would show the percent of offered stock to the public market. Theoretically, it could indicate the influence of the share offered to the performance of the company. The following IPO year dummy variable represents the control for distress market situations, as there are included dates of initial offering from 2007 to 2009, which was unstable time in terms of world financial crisis. I want to observe how it could influence the overall situation. Moreover, I want to estimate the influence of the market-to-book ratio at the time of IPO on the performance measure. This variable represents the perception of the company by the market participants since it is the relation of market value to book value of the firm, also the convention is that this ratio does not work good well with companies with lots of intangible assets, but the nature of growth capital-backed firms eliminates this concern. The other dummy variable considering the industry specifics, I outlined financial sector there and also added the real estate companies. Typically, the industry adjustments are needed in order to distinguish the business models presented in those businesses. The important consideration is that the financial industry companies are in the sample, it could be misleading in terms of the specifics of growth capital-backed companies, but I assume that these financial firms could also either invest in tangible assets or make acquisitions in the future, that is why they could be in the sample.

As I have stated previously, the suggested control variables are size of the company at the moment of initial offering and the age by which this offering is made. Typically, the signs of these variables are positive in the researches outlined previously. Hence, the regression of the following type will be applied in order to control for correctness:

$$\boldsymbol{IPO\ performance\ measure} = a_i + \beta_1 SIZE_i + \beta_2 ln(1 + AGE_i) + \varepsilon_i \quad (7)$$

where, IPO performance measure are either short-term CAR_i or long-run $BHAR_i$.

The nature of calculations applied for short- and long-run performance is similar, but different time spans are considered. Therefore, I also want to observe how the factors influence the short-term performance. These would give more comprehensive analysis on the issue of factors' influence. The models with CARs as dependent variables would be applied:

$$\boldsymbol{CAR} = a_i + \beta_1 ln(1 + AGE_i) + \beta_2 SIZE_i + \beta_3 VOL_i + \beta_4 LEVERAGE_i + \beta_5 ROA_i + \beta_6 LIQUIDITY_i + \beta_7 M/B_i + \beta_8 IPO\ YEAR\ dummy + \beta_9 Industry\ dummy + \varepsilon_i \quad (11)$$

$$\boldsymbol{CAR3} = a_i + \beta_1 ln(1 + AGE_i) + \beta_2 SIZE_i + \beta_3 VOL_i + \beta_4 LEVERAGE_i + \beta_5 ROA_i + \beta_6 LIQUIDITY_i + \beta_7 M/B_i + \beta_8 IPO\ YEAR\ dummy + \beta_9 Industry\ dummy + \varepsilon_i \quad (12)$$

Moreover, there are going to be three multiple regression models with different time horizon BHARs. I calculate three of them: one-, two- and three-year.

$$\boldsymbol{BHAR1} = a_i + \beta_1 CAR_i + \beta_2 ln(1 + AGE_i) + \beta_3 SIZE_i + \beta_4 VOL_i + \beta_5 LEVERAGE_i + \beta_6 ROA_i + \beta_7 LIQUIDITY_i + \beta_8 M/B_i + \beta_9 IPO\ YEAR\ dummy + \beta_{10} Industry\ dummy + \varepsilon_i \quad (8)$$

$$\boldsymbol{BHAR2} = a_i + \beta_1 CAR_i + \beta_2 ln(1 + AGE_i) + \beta_3 SIZE_i + \beta_4 VOL_i + \beta_5 LEVERAGE_i + \beta_6 ROA_i + \beta_7 LIQUIDITY_i + \beta_8 M/B_i + \beta_9 IPO\ YEAR\ dummy + \beta_{10} Industry\ dummy + \varepsilon_i \quad (9)$$

$$\boldsymbol{BHAR3} = a_i + \beta_1 CAR_i + \beta_2 ln(1 + AGE_i) + \beta_3 SIZE_i + \beta_4 VOL_i + \beta_5 LEVERAGE_i + \beta_6 ROA_i + \beta_7 LIQUIDITY_i + \beta_8 M/B_i + \beta_9 IPO\ YEAR\ dummy + \beta_{10} Industry\ dummy + \varepsilon_i \quad (10)$$

The literature on the buy-and-hold abnormal returns suggests the high right skewness of the data, hence several significantly large abnormal returns could possibly influence the results of the positive performance. Therefore, in order to check the influence of factors on positive performance, I will introduce the binary outcome model which is logit regression. This model will help to estimate the probability of the outcome equals one, in other words the probability of positive long-run performance and the influence of the factors on those performance. The model of the following type will be created:

$$Pr(Y = 1|X_i) = F(\beta_0 + \beta_1 CAR_i + \beta_2 ln(1 + AGE_i) + \beta_3 SIZE_i + \beta_4 VOL_i + \beta_5 LEVERAGE_i + \beta_6 ROA_i + \beta_7 LIQUIDITY_i + \beta_8 M/B_i + \beta_9 IPO\ YEAR\ dummy + \beta_{10} Industry\ dummy \quad (13)$$

The logit model relies on the F distribution, i.e., cumulative standard logistic distribution. The similar probit model could be introduced, but it measures the same things with only one difference in distribution. Hence, I will use logit regression in order to obtain the results. The important consideration here is the number of positive and negative returns obtained; it should be sufficient for the model. The positive buy-and-hold abnormal returns will be indicated as one, and negative as zeros. This would be applied to two- and three-years performance indicator. Therefore, it will show the influence of factors on the probability of positive outcome. The other consideration concerns the number of factors that could be used in the model, i.e., the number of independent variables. The pool of variables presented is substantial and could be an issue while building the model because the rule of thumb for number of regressors is ten times lower than positive outcomes. Hence, I suggest in my models could be from four to six independent variables.

The summary of factors as well as their description and measurement are presented in the table:

Table 3 Summary of dependent and independent variables

Dependent variable	**Description**	**Measurement**
CAR	Cumulative abnormal returns are the sum of anormal returns for a given period	Firstly, abnormal returns relative to benchmark are calculated, then the summation is made. Presented in formulas (2) and (3)
BHAR	The BHAR is based on the principle of long holding a stock and calculates abnormal returns by deducting the normal (i.e., benchmark) buy-and-hold return.	The difference between compounded returns of a company and benchmark. Given in formula (4)
Value-weighted CARs & BHARs	Abnormal returns are weighted by each company's market cap in order to control for large companies/their returns	The abnormal returns are weighted by weight coefficient. Given in formula (14) and (15)
Independent variable	**Description**	**Measurement**
Age	Difference between the year of IPO and the year of company's establishment	The unusual calculation methodology is presented in Ritter (1991) and Brau et al.

		(2012). Natural logarithm of (1+age) is calculated
Size	Size of company in terms of total assets	Measured as logarithm of total assets as of IPO time
Vol	The percentage of shares offered during IPO relative to shares outstanding	Number of shares offered divided by number of shares outstanding
Leverage	How company financing its activities, shows the usage of debt capital	Percentage of debt in common equity
ROA	Shows how efficiently assets are managed and how company utilizes the resources	Net income/total assets at the time of IPO
Liquidity	Internal operating indicator which shows the ability to pay short-term obligations	Measured as current ratio, i.e., current assets/current liabilities
Market-to-book ratio	Shows the perception of the company's value by the market participants	Market cap/total book value
Year dummy	Controls for distress conditions of 2007-2009 years	One if distress, zero otherwise
Industry dummy	Controls for financial industry differences	Financial industry and one company from real estate sector indicated as 1, otherwise zero

2.3. Data and sample

Sample construction for the research is an important step in order to reach meaningful results. The main approach used in this study is to use the definition made by professor J. Ritter of growth capital-backed initial offerings and his firms' identification in order to construct the sample. I suggest using the data on IPOs from Warrington College of Business website (Ritter, n.d.) where Ritter identifies those types of firms according to three criteria:

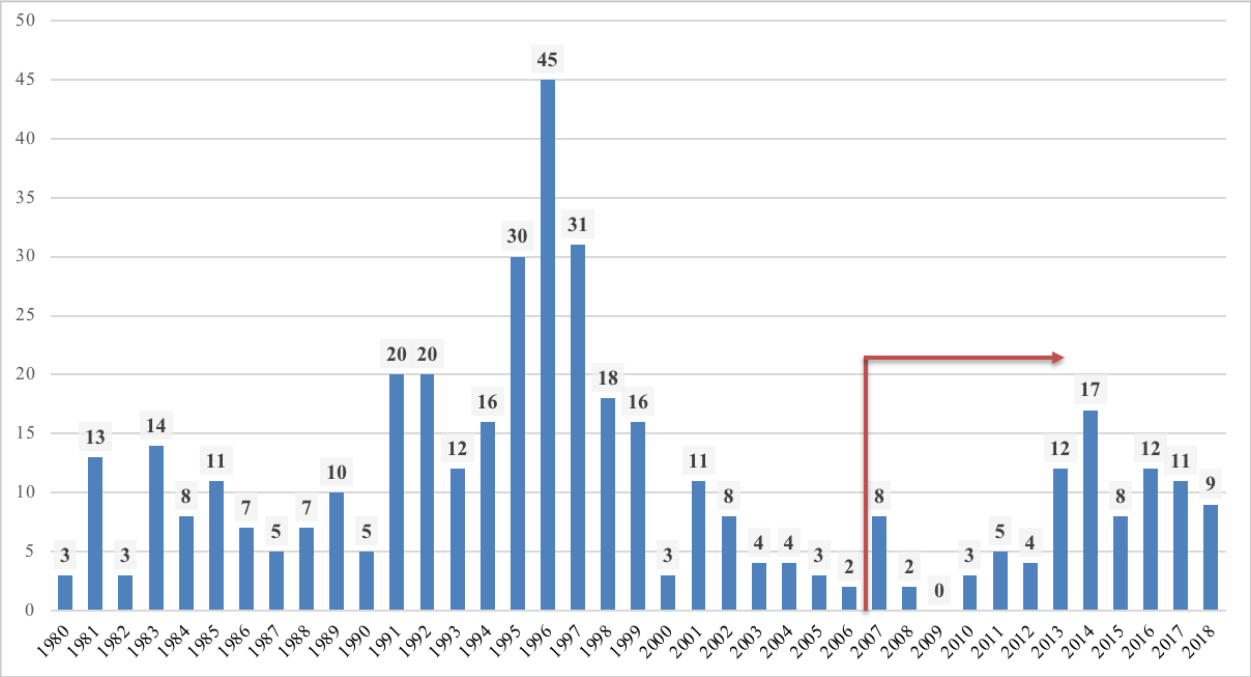
- Financial sponsor during the IPO deal is necessary, hence providing equity capital prior to the deal. Otherwise, it is not an "backed" deal.

- The controlling position of the sponsor is not limited. This point mainly concerns the fact that the sponsor is not necessarily becomes a major owner of company's shares, i.e., controlling shareholder. For example, this could be a regular purchase of company's stake, but not from the current shareholders.
- The third criterion is considered as the most important, and the reason why the type of financing is called "growth capital-backed" is exactly because the financial sponsors are investing in growth of either tangible assets or in projected acquisitions. The sponsorship in technology is not considered as growth capital-backed, but as venture capital investment. The classic example of such sponsorship is retail stores, where the company has further investments in construction. Hence, financial sponsors are willing to invest in such type of development or growth. The other point is further acquisitions that will be made.

I state that the independent and standalone identification of growth capital-backed initial offerings is a complicated and time-consuming issue as there should be three criteria met in order to define the IPO as growth capital-backed. Therefore, I suggest using this approach and data provided by J. Ritter.

The research provided by Ritter (2015) includes time spans of initial offerings starting from 1980 prior to 2012. I suggest using most recent time span till year 2018, because the three year buy-and-hold returns are calculated, for this I need companies to be present on the public market at least three years after an initial offering. The issue for the research constitutes the definition of the starting point, i.e., the year from which I should start creating the sample. I should mention that during the time span of the whole Ritter's data set from year 1980 the economic conditions were significantly volatile, recalling the dotcom crisis of early 2000, especially booming initial public offering activity, and some other distressed situations on American and world markets. The choice of the year 2007 is determined by the economic conditions at that times, i.e., we know that the year after that there was one of the biggest financial crises worldwide. The inclusion of such distressed time horizon could be justified by the interest of what was going on with the growth-capital backed companies in terms of their performance. More precisely, the time of distress could be one of the influencing variables to account for in the second part of analysis. Moreover, after the bubble crisis of 2000, the number of growth capital backed companies developing an initial offering deals was not extremely big and started to increase only in 2007. The whole data could be observed on the following Figure:

Figure 3 Number of growth capital-backed IPOs by year



Note: Red arrow indicates the chosen time frame for the research. Made by author

The sample of growth capital-backed IPOs consists of 85 companies in various industries. All the presented firms are NASDAQ or NYSE listed. Hence, for the benchmark calculations necessary in BHAR methodology, the NASDAQ Composite index (IXIC) is used. It includes almost all the stocks listed on exchange; hence I suggest it shows overall market movement. As it could be noticed, the primary focus of this study is developed market, the market of the United States. This is due to the fact of information availability and the other argument is that the American market could be considered as the most developed in terms of initial public offerings and sufficient in the sense of information asymmetry, hence growth capital-backed IPOs are properly identified. That point leaves the room for the further discussion, for example similar research on the developing markets could be done.

The approach to the information gathering is an important issue. Initial public offering by nature implies that the company before this event was not open and there is a limitation to information access. However, on every stock exchange there exist special requirements to the information that should be disclosed before an IPO and these filling on the US market are governed by Security and Exchange Commission (SEC). These forms allow to gather important information as is at the moment of offering. Therefore, these are used as a source of information for data collection. Moreover, the data base of Thomson Reuters was used for collection of other important indicators such as prices' values, companies' operational indicators, information on the peers and benchmark.

According to the international Industry Classification Benchmark taxonomy made by FTSE Russel, the sample consists of 9 different industries and 30 different subsectors. The results are presented in Table 3 and 4:

Table 4 Industry breakdown

ICB Industry	Frequency	% of total sample
Consumer Discretionary	19	22,35%
Consumer Staples	3	3,53%
Energy	19	22,35%
Financials	16	18,82%
Health Care	8	9,41%
Industrials	10	11,76%
Real Estate	1	1,18%
Technology	5	5,88%
Utilities	4	4,71%
Total	**85**	**100%**

Table 5 Subsector breakdown

ICB Subsector	Frequency	% of total sample
Aerospace and Defense	1	1,18%
Alternative Energy	1	1,18%
Automobiles and Parts	1	1,18%
Banks	3	3,53%
Beverages	1	1,18%
Construction and Materials	3	3,53%
Consumer Services	2	2,35%
Electricity	1	1,18%
Finance and Credit Services	5	5,88%
Food Producers	2	2,35%
Gas, Water and Multi-utilities	1	1,18%
Health Care Providers	4	4,71%
Household Goods and Home Construction	3	3,53%
Industrial Support Services	3	3,53%
Industrial Transportation	3	3,53%
Investment Banking and Brokerage Services	4	4,71%
Leisure Goods	1	1,18%
Media	1	1,18%
Medical Equipment and Services	2	2,35%
Mortgage Real Estate Investment Trusts	1	1,18%
Non-life Insurance	3	3,53%
Oil, Gas and Coal	18	21,18%
Personal Goods	2	2,35%
Pharmaceuticals and Biotechnology	2	2,35%

Real Estate Investment Trusts	1	1,18%
Retailers	3	3,53%
Software and Computer Services	4	4,71%
Technology Hardware and Equipment	1	1,18%
Travel and Leisure	6	7,06%
Waste and Disposal Services	2	2,35%
Total	**85**	**100%**

The major part consists of companies in oil and gas economy sector. This is not surprising as this sector is characterized by the capital-intensive processes and substantial investments in tangible assets. Other presented industries are associated with the intensive investments in tangible assets as well. It corresponds with the Ritter (2015), the author identifies typical industries for such type of financing as "Growth capital investing is correlated with the industry that the company operates in: funding retail operations or the consolidation of funeral homes, dental offices, or medical offices is generally growth capital investing, as is hospital operation" (Ritter, 2015). However, the one noteworthy component here is the presence of biotechnological company in the classification. This could be a contradiction with the stated proposition in the article, because the author outlines the distinction between classical venture capital financing and growth capital financing, i.e., "financial sponsors that fund technology and biotechnology companies are VC investors" according to his classification. More precisely, if the company is in biotech industry, it automatically considered as conventional venture capital but not as growth capital. I suggest that this exception exists due to the high tangible assets investments, in the production of healthcare supplies or similar. Hence, this company is more on tangible side of the business rather than exploitation of technology or intangible assets.

2.4. Descriptive statistics

The presented chapter is devoted to the important part of the data description – descriptive statistics. It is particularly important to understand the basic characteristics of the data. In the Table 5, there is a description and various attributes of the variables that are potential dependent values. I calculated the cumulative abnormal returns and buy-and-hold abnormal returns as the main proxies of short and long-term performance of growth capital-backed initial offerings. There are two measures of CAR and three measures of BHAR, these are for different time horizons. The CAR is calculated for one and three days after an IPO, while BHAR is calculated for one, two and three years after an IPO. This is done in order to compare the time span differences among the returns. The major variable of interest stays three-year BHAR as it was discussed in previous

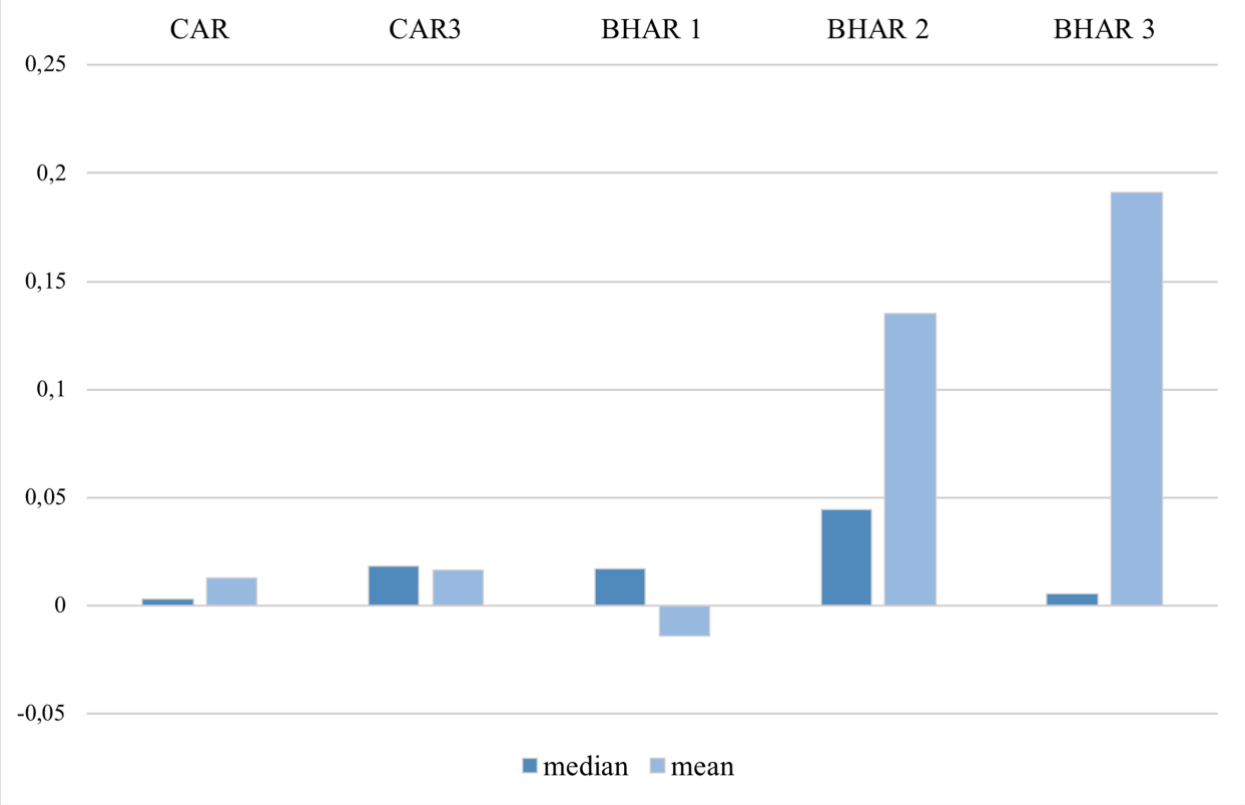
chapter. I suggest that the other variables of interest which will be the independent variables in the second part of analysis also should be described.

Table 6 Descriptive statistics for CAR and BHAR

	CAR	CAR3	BHAR 1	BHAR 2	BHAR 3
nbr.val	85	85	85	85	85
nbr.null	2	0	0	0	0
nbr.na	1	1	1	1	1
min	-0,11176	-0,2756	-1,30174	-1,67013	-1,85629
max	0,158765	0,154665	1,092933	2,338241	5,848162
range	0,270528	0,430261	2,394668	4,00837	7,704457
sum	1,078438	1,363209	-1,20276	11,49539	16,22762
median	0,002722	0,018291	0,016803	0,044583	0,005322
mean	0,012688	0,016038	-0,01415	0,13524	0,190913
SE.mean	0,005023	0,007582	0,047109	0,077089	0,146342
CI.mean.0.95	0,009989	0,015078	0,093682	0,153299	0,291018
var	0,002145	0,004887	0,188638	0,505125	1,82037
std.dev	0,046311	0,069904	0,434325	0,710721	1,349211
coef.var	3,650163	4,358715	-30,6941	5,255267	7,067146

As it could be observed from the results in Table 5, on average cumulative abnormal returns for one and three days show the positive performance of approx. 1%. The significance tests will be applied in order to observe the validity as now the results are almost not distinguishable from zero. The next noticeable point is that mean three-year benchmark adjusted BHAR is around 19%, which indicates positive performance of the companies. I suggest this is in line with the results obtained by Ritter (2015). The paper's result was approx. 14% for three-year BHAR. Moreover, it could be observed that the highest variance and standard deviation is exactly in the three years period estimation, I suggest this is due to the longer time horizon observed as the monthly returns experienced high variability. The chart 3 below represents the comparison of three-year benchmark adjusted CARs and BHARs, which is an interesting thing to see.

Figure 4 Comparison of mean and median of CARs & BHARs

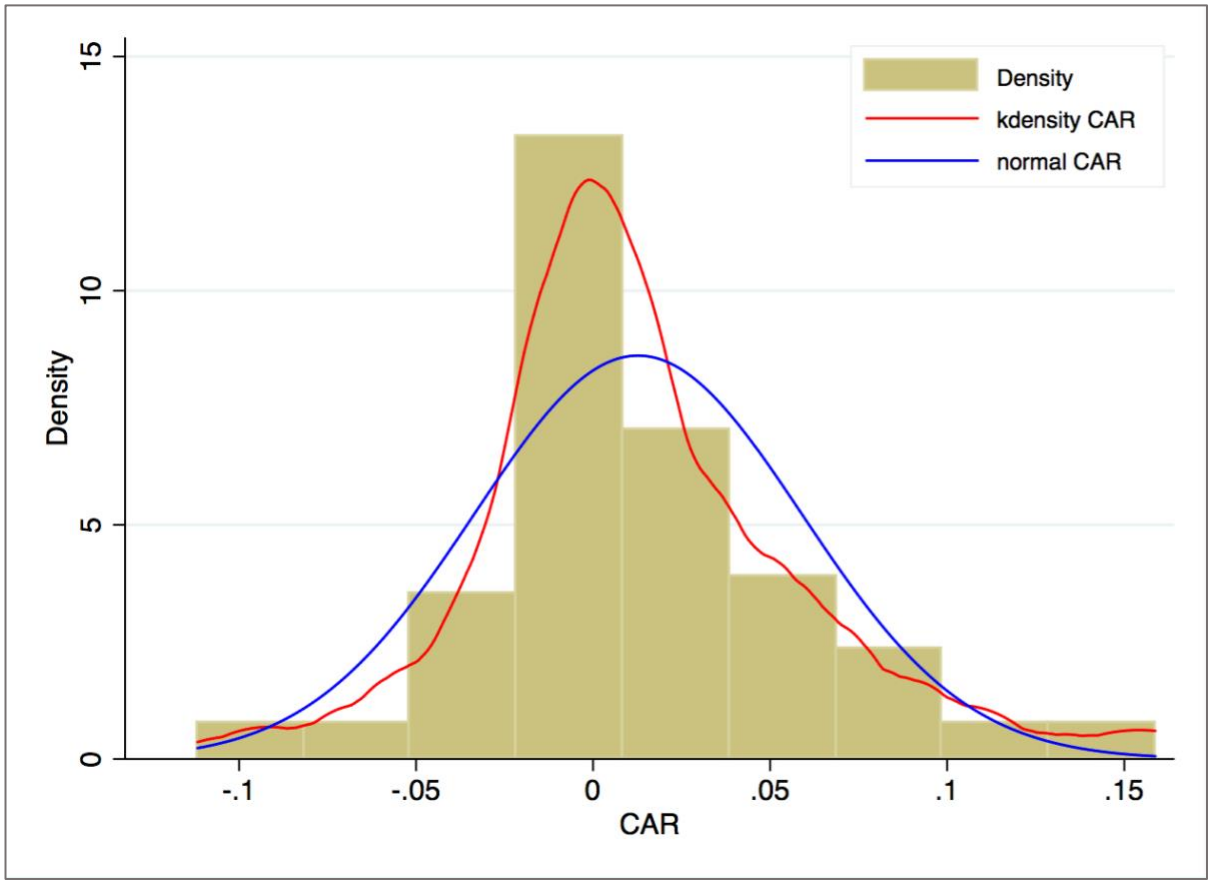


Source: [Made by author]

There are several noticeable things. First is that the one- and three-days CARs have low difference in means and medians while the BHARs have the opposite situation. I suggest looking at their distribution. The literature analysis (Brav, 2000) on this issue and the empirical evidence indicates that the BHARs of all time horizons tend to be right skewed due to the compounding effect.

On the chart 4 we can observe the properties of cumulative abnormal returns' distribution:

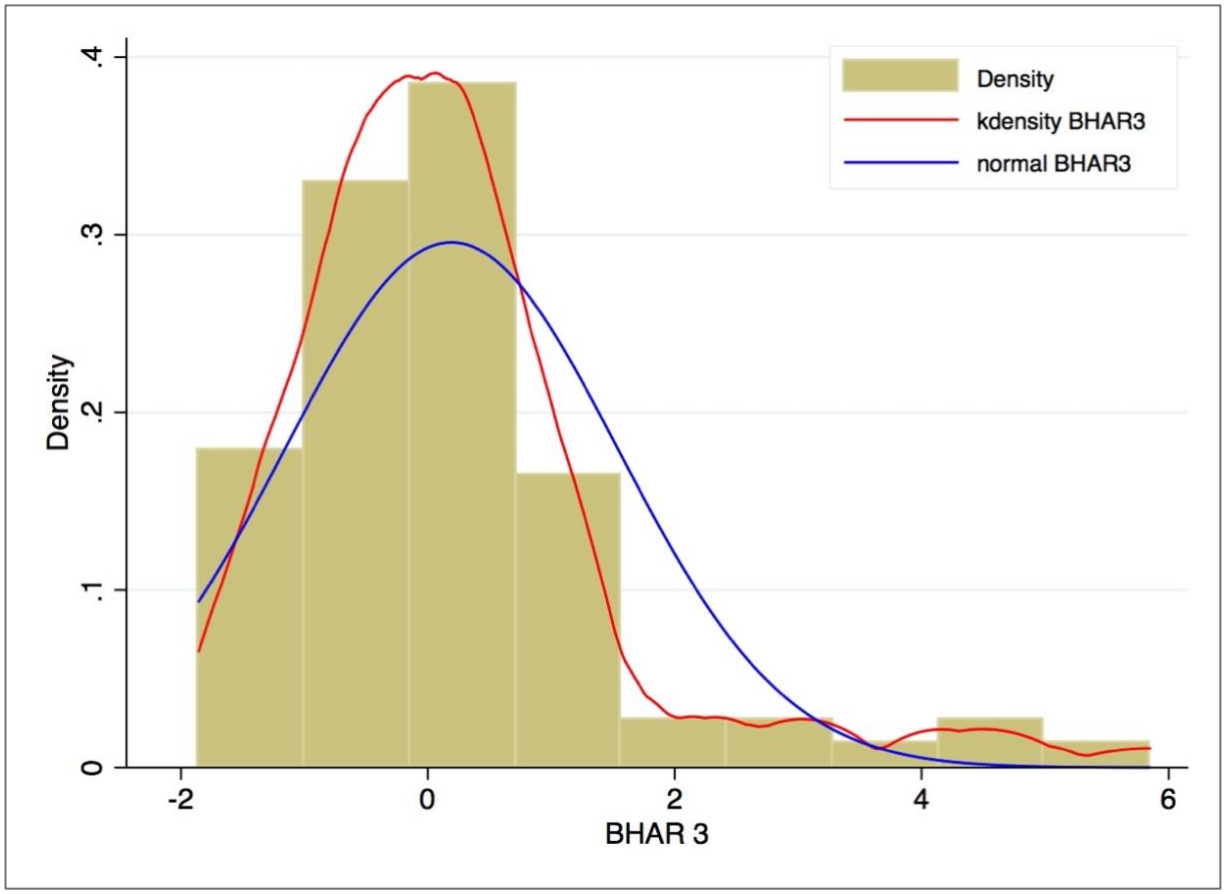
Figure 5 CAR's distribution



Source: [Made by author]

It is already could be seen that the distribution has right skewness properties as the Kernel density estimation line (probability density line) is located to the left of normal distribution function. The figure for BHAR was applied as well. On the chart 5 we can observe the distribution as well as the kernel and normal estimation. It is hard to judge from the first sight, but we can vividly see the heavy right tail of the distribution. I suggest that such difference in mean and median estimations is due to this issue. Moreover, I want to estimate these properties (skewness and kurtosis) by analytical tests in order to confirm the hypothesis about them. However, I still suggest using these variables for further estimations in the models. The elimination of this issues could be reached through various transformations of the variables; however, the logarithmic transformation could lead to very small, almost not feasible figures for analysis, probably quadratic transformation could be applied, but with the tradeoff of eliminating negative abnormal returns, which could be a potential threat.

Figure 6 BHAR's distribution



Source: [Made by author]

In the following table I provide the statistics for those properties. It is mainly done in order to check the shapes of the distribution which is important property for further analysis.

Table 7 Skewness & kurtosis statistics for CARs & BHARs

	CAR	**CAR3**	**BHAR 1**	**BHAR 2**	**BHAR 3**
skewness	0,584319	-0,90694	0,028868	0,511706	1,755553414
skew.2SE	1,11873	-1,73641	0,05527	0,979705	3,361158005
kurtosis	1,308359	2,839875	0,412421	0,398779	4,239230249
kurt.2SE	1,265934	2,747789	0,399048	0,385848	4,101769044
normtest.W	0,953706	0,941148	0,984377	0,976263	0,851529068
normtest.p	0,004007	0,000739	0,396167	0,118436	$9{,}26220*10^{-8}$

As it could be seen from the Table 7, both CAR and BHAR3 tend to have skew.2SE more than 1 (which is an indicator for significance of the skewness), hence these variables are positively skewed, and it is significantly different from zero. It is interesting to notice that the 3-day CAR measure has the negative significant skew. The kurtosis measure is aimed to describe the tails of the distribution or its peakedness. I suggest that we have CAR, CAR3 and BHAR3 as the heavy-

tailed distributions (or also called leptokurtic distributions). After that, the provided statistics also gives the Shapiro-Wilk test with the associated probability. According to the results, it is not surprising that the p-values for those three variables: CAR, CAR3 and BHAR3 are < 0,05, hence the hypothesis about derived normal distribution of those values is rejected, while for BHAR1 and BHAR2 it is not the case and the test suggests that these variables are less likely to deviate from normal distribution. The number of negative and positive cases is further calculated:

Table 8 Number of negative and positive CARs & BHARs

Number of cases	**CAR**	**CAR 3**	**BHAR 1**	**BHAR 2**	**BHAR 3**
Negative	35	30	41	40	42
Positive	48	55	44	45	43

As we can observe, the number of positive cases is dominated in all the abnormal returns, but in buy-and-hold abnormal returns, these numbers are almost equal. This brings up the idea of binary outcome model in order to obtain the difference of factors' influence on different outcomes of abnormal returns. Hence, I suggest this could be a valuable extension of the proposed research as the number of positive and negative outcomes seem to be sufficient.

After that I suggest checking the variables' means on statistically significant difference from zero, in order my results be valid in statistical sense. The Student's one-sample two-tailed t-test was performed for this purpose:

Table 9 Zero mean t-test for CARs & BHARs

H0:	Mean = 0				
H1:	Mean ≠ 0				
Variable	**CAR**	**CAR 3**	**BHAR 1**	**BHAR 2**	**BHAR 3**
Obs	85	85	85	85	85
Degrees of freedom	84	84	84	84	84
T statistics	2.5258	2.1152	-0.3004	1.7543	1.3046
p-value	0.0134	0.0374	0.7646	0.0830	0.0978
95% conf. interval	0.0026984	0.0009598	-0.1078318	-0.1480592	-0.1001049
	0.0226766	0.0311157	0.0795316	0.1585389	0.4819312
Significance	at 5% level	at 5% level	not significant	at 10% level	at 10% level

As it could be observed from the results, each variables' mean apart from two-year BHAR is significantly different from zero. Hence, further analyses could be applied and the conclusion about statistical significance of the mean coefficient could be derived.

The next step I want to describe is connected to the descriptive statistics of the value-weighted estimations of BHARs and CARs. There is an extensive evidence in literature in favor

of those estimations (Ritter, 1991). The value-weighted measure of abnormal returns is based on the market value of the whole growth capital-backed portfolio. This measure could be useful for further regression estimations. The value-weighted measure is calculated according to the initial market capitalization of the company; hence the initial abnormal returns are calculated in the following way:

$$AR_t = \sum_{i=1}^{n} w_i AR_{it} \qquad (14)$$

where,

$$w_i = {}^{S_i}/_{\sum S_i} \qquad (15)$$

Thus, w_i represents the weight of one company in the portfolio and S_i is the value of one company's market capitalization in the portfolio. This weighting scheme is particularly useful for consideration and adjustment for outliers or big companies which potentially could contribute to the significant results' misinterpretation. For example, majority of stocks in the portfolio could be with moderate market cap and with lower abnormal returns while one company with significantly larger market cap and abnormal returns would skew the indicators of abnormal returns and question the generalization of the results. After this adjustment, the calculations of CAR_i and $BHAR_i$ are similar to equally weighted portfolio.

The descriptive statistics for those measures are presented in the following Table 9:

Table 10 Descriptive statistics for value-weighted CAR and BHAR

	VW_CAR	VW_CAR3	VW_BHAR1	VW_BHAR2	VW_BHAR3
nbr.val	85	85	85	85	85
nbr.null	2	0	0	0	0
nbr.na	0	0	0	0	0
min	-0,00165152	-0,00346	-0,03139	-0,0331986	-0,03614
max	0,002314947	0,010127	0,01909	0,03658169	0,064372
range	0,003966467	0,013584	0,050478	0,06978028	0,100511
sum	0,015215588	0,029357	-0,00112	0,05143366	0,164292
median	$1{,}0042*10^{-5}$	$6{,}71*10^{-5}$	$4{,}7*10^{-5}$	0,00022859	$1{,}61*10^{-5}$
mean	0,000179007	0,000345	$-1{,}3*10^{-5}$	0,0006051	0,001933
SE.mean	$6{,}2323*10^{-5}$	0,000152	0,000581	0,00096851	0,00159
CI.mean.0.95	0,000123936	0,000303	0,001154	0,00192599	0,003162
var	$3{,}3015*10^{-7}$	$1{,}97*10^{-6}$	$2{,}86*10^{-5}$	$7{,}9731*10^{-5}$	0,000215
std.dev	0,000574588	0,001405	0,005352	0,00892925	0,014658
coef.var	3,209862449	4,06695	-405,506	14,7565998	7,583411

The results are quite obvious, because the values are not equally weighted but weighted according to the market capitalization of the corresponding company in the portfolio, the values of mean and

median are very small, almost indistinguishable from zero. However, the regressions still will be applied with the value-weighted variables.

As the next step I suggest describing the independent variables which would be applied in the models.

Table 11(a) Descriptive statistics for independent variables

	LN(1+age)	Market-to-book	Ln TA	Ln MV	Vol, %
nbr.val	85	85	85	85	85
nbr.null	0	0	0	0	0
nbr.na	0	0	0	0	0
min	0,693147	-213,17	17,76706	17,84175	2,068966
max	4,859812	566,07	25,18169	23,35251	812,3477
range	4,166665	779,24	7,414624	5,510758	810,2787
sum	208,8862	628,72	1732,756	1731,576	3080,454
median	2,397895	2,45	20,09998	20,4714	20,76671
mean	2,457485	7,396706	20,38537	20,37148	36,24063
SE.mean	0,084545	7,130179	0,149988	0,122494	9,781406
CI.mean.0.95	0,168127	14,17914	0,298269	0,243592	19,4514
var	0,607571	4321,354	1,912206	1,2754	8132,452
std.dev	0,779468	65,73701	1,382825	1,129336	90,18011
coef.var	0,317181	8,887335	0,067834	0,055437	2,48837

Table 11(b) Descriptive statistics for independent variables (cont.)

	Leverage	ROE	ROA	Liquidity
nbr.val	85	85	85	85
nbr.null	1	0	0	0
nbr.na	0	0	0	0
min	-325,603	-12,3666	-1,2012	0,11
max	64,033	1,3829	0,4453	823,38
range	389,6355	13,7495	1,6465	823,27
sum	-197,655	-17,0188	-1,0485	1052,63
median	0,326	0,0222	0,0238	1,77
mean	-2,32536	-0,20022	-0,01234	12,38388
SE.mean	3,968412	0,156018	0,023465	9,662097
CI.mean.0.95	7,891622	0,310258	0,046663	19,21414
var	1338,605	2,069025	0,046801	7935,269
std.dev	36,58695	1,438411	0,216337	89,08013
coef.var	-15,7339	-7,18411	-17,538	7,193231

There presented two variables for the same measure, the size could be measured by the total assets or by market capitalization. Again, the operating or market proxies. I suggest usage of only one,

however which one would be decided while building the models. Moreover, there is also return on equity measure collected and described but I suggest using return on assets.

Moreover, I want to see the correlation structure of the variables:

Table 12 Correlation matrix

	CAR	CAR3	BHAR1	BHAR2	BHAR3	LN1age	Market~k
CAR	1.0000						
CAR3	0.6646*	1.0000					
BHAR1	0.1635	0.2680*	1.0000				
BHAR2	0.1091	0.2567*	0.8051*	1.0000			
BHAR3	0.1420	0.2093	0.5260*	0.7504*	1.0000		
LN1age	0.1456	0.0885	0.1948	0.1806	0.1585	1.0000	
Markettobook	-0.1032	-0.1409	0.0005	0.0388	0.0205	0.0258	1.0000
LnMV	0.1604	0.1599	0.0305	-0.0514	0.0325	-0.2031	0.1827
LnTA	0.1732	0.2624*	0.0522	-0.0687	-0.0222	-0.1961	-0.0622
Vol	-0.0548	-0.0706	-0.1514	-0.1027	-0.1097	-0.0509	-0.0244
Leverage	0.0214	-0.0237	-0.0512	0.0810	0.0105	0.0008	0.2708
ROE	0.0827	0.1261	0.1462	0.1645	0.0752	0.0063	0.0944
ROA	-0.0399	0.0896	0.2358*	0.2402*	0.1680	0.1268	0.0960
Liquidity	0.0488	-0.0231	-0.0219	-0.0516	0.0581	-0.0573	-0.0010
	LnMV	**LnTA**	**Vol**	**Leverage**	**ROE**	**ROA**	**Liquid~y**
LnMV	1.0000						
LnTA	0.6136*	1.0000					
Vol	-0.1156	-0.0608	1.0000				
Leverage	-0.0221	-0.0390	0.0162	1.0000			
ROE	-0.0193	0.0874	0.0137	-0.0066	1.0000		
ROA	0.0209	0.1170	-0.0376	-0.0060	0.7419*	1.0000	
Liquidity	0.0047	0.1129	0.0061	0.0344	0.0222	0.0198	1.0000
Note: With (*) indicated 5% level of significance							

As it could be seen, there is a significant (at 5% level) correlation among CARs and BHARs, which is in line with the theory, but with the increase of time horizon, the correlation weakens, i.e., three-year BHAR has small coefficient with one-day CAR, while one-year BHAR has larger significant coefficient with three-day CAR. However, the noticeable thing is that return on asset is correlated with one and two-year BHARs, hence, it could substantially explain BHAR dependent variable. The other coefficients could be considered as small and the conclusion is that multicollinearity issue among the variables will not be present. In the correlation analysis the number of unused variables is presented, more precisely, I was considering including the return on equity as a part of the factor analysis. However, I suggest that from the conceptual point of view, return on assets is much more relevant for this research due to the specifics of growth capital-backed companies. The crucial analysis should be performed before subsequent models' building.

We should ensure the absence of multicollinearity among the independent variables which will be used in further models:

Table 13 VIF indexes for independent variables

Variable	VIF	SQRT VIF	Tolerance	R-Squared
LN1age	1.08	1.04	0.9297	0.0703
Markettobook	1.37	1.17	0.7288	0.2712
LnTA	1.12	1.06	0.8934	0.1066
Vol	1.02	1.01	0.9800	0.0200
Leverage	1.31	1.15	0.7614	0.2386
ROA	1.03	1.02	0.9701	0.0299
Liquidity	1.01	1.00	0.9943	0.0057
Mean VIF	1.13	N/A	N/A	N/A

According to this analysis there is no evidence of multicollinearity among the independent variables since the variance inflator factor (VIF) is lower than "rule of thumb" value of 5.

2.5. Econometric analysis

The presented part is devoted to the presentation of regression analysis of the factors' influence. The models that have been described above are built. I suggest building the models only for the dependent variables significantly different from zero, these are: CAR, three-day CAR, one and three-years BHARs according to the t-statistics provided earlier. Moreover, the models are being adjusted and different values of dependent and independent variables are applied, meaning that, for example, I have different measures of firm's size: operating and market ones, and I want to see influence of both perspectives. Value weighted measures of cumulative and buy-and-hold abnormal returns (weighted by market cap) are also applied and the models are built in order to observe the difference with the common approach.

First of all, I build the model with the cumulative abnormal return as the dependent variable:

Table 14 Equally weighted CAR models

Dependent variable / **Independent variable**	**CAR**	**CAR3**
LN1age	.01383739** (.0060151)	.01230248 (.011617)
Markettobook	-.00013845*** (.0000255)	-.00025144*** (.0000304)
LnTA	.01124007** (.0042901)	.01500076** (.0064612)

Dependent variable / Independent variable	CAR	CAR3
Vol	$-7.201*10^{-6}$ (.0000196)	-.00002781 (.000027)
Leverage	.00013727*** (.0000481)	.00017332*** (.0000537)
ROA	-.01894567 (.0313818)	.02332879 (.0286982)
Liquidity	.0000285*** (.0000108)	-.00001579 (.0000122)
Year_dummy	.02416861 (.014575)	.02155185 (.0230417)
Industry_ dummy	.00509388 (.0117443)	.0020652 (.0151148)
constant	-.25313912** (.0972681)	-.31897777** (.1442222)
R – squared	0.1242	0.0992
F statistics	16.45	30.35
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors indicated in parentheses		

As it could be seen, the models performed quite good, both models are significant in terms of F-statistics. R-squared for the first model is 16,45%, while for the second – 9,9%, meaning that 16% and almost 10% of the CARs' variances are explained by variances of independent variables. The variables of age, market-to-book, size in terms of total assets, leverage and liquidity variables are significant for one day performance. While for three-day CAR, market-to-book, size and leverage are significant variables. The noticeable relations are observed: age is significant for the one-day cumulative abnormal return, market-to-book ratio is significant variable which has negative sign. Probably, in short-term performance, immediately after an IPO, the higher expectations of the company's value are negatively associated with the real price performance, meaning that higher market's evaluation relative to real book value could make the performance worse. Moreover, the size of the company measured as the logarithm of total assets has significant positive coefficients, which is in line with the literature observed. In the short run, the leverage has also positive influence on the abnormal returns, which could be an indicator of developing company and market participants expect the wise usage of the debt capital in those firms. Operating liquidity measure is also positively associated with one-day performance, however on three-day horizon it appears to be insignificant. The following step is to observe the performance on the example of value weighted cumulative returns. Overall, the measures of control variables

represent the expected association with the short-term initial offerings' performance. On the next step, the value weighted CAR models are built.

Table 15 Value weighted CAR models

Dependent variable / Independent variable	VW_CAR	VW_CAR3
LN1age	.00003673 (.0000763)	.00006735 (.0001365)
Markettobook	$-4.409*10^{-6}$*** ($4.56*10^{-7}$)	$-9.626*10^{-6}$*** ($1.48*10^{-6}$)
LnTA	.0002093** (.0000957)	.00061658** (.0002684)
Vol	$-3.913*10^{-7}$ ($5.63*10^{-7}$)	$-2.511*10^{-7}$ ($8.87*10^{-7}$)
Leverage	$3.493*10^{-6}$*** ($6.57*10^{-7}$)	$7.489*10^{-6}$*** ($1.91*10^{-6}$)
ROA	.00016516 (.0002713)	.00029973 (.0004407)
Liquidity	$9.238*10^{-8}$ ($2.11*10^{-7}$)	$-7.978*10^{-7}$*** ($2.66*10^{-7}$)
Year_dummy	.00007727 (.0001142)	.00025874 (.0002364)
Industry_ dummy	-.00008467 (.0002047)	.00022993 (.0002432)
constant	-.0041114** (.0020279)	-.01234585** (.0051543)
R – squared	0.2930	0.3111
F statistics	834.63	851.15
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors are indicated in parentheses		

Overall, it could be seen that the value weighted models perform much better in terms of R-squared metrics, hence the variances of independent variables better explain the variance of the dependent ones. The values of R-squared are: 29,3% and 31,11% respectively for value weighted one and three-day CARs. Both models are significant in terms of F-statistics. The remarkable things here is that age measure turns out to be insignificant in both models, while the size measures are significant in both models, and the signs remain the same for both models. For both models, the variables of size, M/B and leverage are significant in terms of t-statistics. Only market-to-book ratio seem to have the negative sign before the coefficients. The aim of building the value-weighted models was to control for outlying returns of large companies. As we can observe, the signs and

coefficients' significance remained the same in both pools of models. Therefore, I suggest this control was made and we can interpret significant coefficients properly. The next step is to identify and describe models of buy-and-hold abnormal returns, which are considered as the main ones in this research.

Table 16 Equally weighted BHAR models

Dependent variable / **Independent variable**	**BHAR2**	**BHAR3**
CAR	1.4157002 (1.721543)	2.9094745 (3.153084)
LN1age	.11267116 (.11245)	.26659208 (.2268499)
Markettobook	-.00010924 (.0004396)	.00023067 (.0009798)
LnTA	-.02735384 (.0581515)	.06893443 (.1260195)
Vol	-.00068393* (.0003761)	-.00118719** (.0005538)
Leverage	.00169985 (.0010489)	-.00023433 (.0017855)
ROA	.71378522*** (.1845951)	.75716528* (.4143668)
Liquidity	-.00038157 (.0002501)	.0007186 (.0004337)
Year_dummy	.17554746 (.2093572)	.47090825 (.3118692)
Industry_dummy	-.03982955 (.2238399)	.25030633 (.3864023)
constant	.42801874 (1.378902)	-1.9696914 (2.858619)
R – squared	0.1167	0.0889
F statistics	7.89	7.67
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors are indicated in parentheses		

The models performed quite good in terms of F-statistics, in both of them, the coefficients are significantly different from zero. R-squared measures are ~11% and ~9% for two- and three-year BHAR respectively. However, the number of significant coefficients decreased with respect to previous models of cumulative returns. The variable of short-term performance – CAR is insignificant in those models, which is counterintuitive, but further models with three-day CAR will be applied as well. The volume of issue is significant in both models and it has negative sign,

hence probably the bigger the percentage of issued shares to shares outstanding, the worse is long-run performance. In three-year model, the variable of return on assets plays role as well, with quite big influence. ROA variable influences the long-tun performance of three years BHAR with positive sign, hence the more returns on assets offers the company on the moment of IPOs, the more it could benefit in long-run. The next models include the cumulative abnormal returns on the horizon of three-days, this is done in order to observe the difference and influence of other short-term performance indicator.

Table 17 Equally weighted BHAR models with 3-day CAR as independent

Dependent variable / **Independent variable**	**BHAR2**	**BHAR3**
CAR 3 day	2.3790023** (.9069675)	3.352684** (1.603157)
LN1age	.10299311 (.1055854)	.26560527 (.2144166)
Markettobook	.00029293 (.0004752)	.00067085 (.0009505)
LnTA	-.0471281 (.0576854)	.05134433 (.1237322)
Vol	-.00062797* (.0003657)	-.00111492** (.0005409)
Leverage	.00148186 (.001073)	-.00041602 (.0017155)
ROA	.63146459*** (.1881929)	.62382929 (.4331405)
Liquidity	-.00030366 (.0002372)	.00085446** (.0004219)
Year_dummy	.15849107 (.2098855)	.46896966 (.32815)
Industry_dummy	-.03753124 (.2173263)	.25820291 (.383916)
constant	.8284985 (1.336979)	-1.6367615 (2.779073)
R – squared	0.1585	0.1074
F statistics	8.74	10.13
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors are indicated in parentheses		

As it could be seen from the models, the cumulative abnormal return of three days plays significant role in long run performance of initial public offering, especially on three-year time horizon since the coefficients of the models are high and significant. Moreover, the value of R-

squared increased by approximately 4 and 3% in models respectively. The significance and sign of other coefficients remained constant and the same compared to previous models. Moreover, as we can see, the year of issuance is insignificant in terms of long-run performance. There also could be observed several noticeable facts, the first is that on three-year horizon, the return on assets becomes insignificant, but the liquidity metrics vise versa became significant. The second fact is that the high proportion of an issue's volume could be negatively associated with the long-run performance of such type firms.

Therefore, I suggest that for three-year long-run performance, the successful case would include reasonable proportion of issued volume relative to shares outstanding, reasonable level of liquidity and return on assets. The last point is interesting in terms of my paper, because by definition the growth capital-backed initial offerings are expected to increase the tangible assets, and the return on the assets as we can see is also important in terms of their performance. Hence, the conclusion is that for their successful long-run performance, the companies should not only state the intension to invest in tangibles but show the returns on them.

Table 18 Value weighted BHAR models

Dependent variable / **Independent variable**	**VW_BHAR2**	**VW_BHAR3**
CAR	.02154281 (.017893)	.02618854 (.0268466)
LN1age	-.00014194 (.0011861)	.00056645 (.0021086)
Markettobook	.00001229 (.0000105)	.00001876 (.0000159)
LnTA	-.00090012 (.0017747)	.00082449 (.0025845)
Vol	-.00001128 (.0000127)	-.00001449 (.0000181)
Leverage	$6.085*10^{-6}$ (.0000134)	$-5.874*10^{-6}$ (.0000202)
ROA	.00946654*** (.0035072)	.01486823** (.0067716)
Liquidity	$-1.802*10^{-6}$ $(2.58*10^{-6})$	$3.818*10^{-6}$ $(4.77*10^{-6})$
Year_dummy	-.00053871 (.0015255)	.00054045 (.0027096)
Industry_dummy	-.00140928 (.0026884)	.00069218 (.0048585)
constant	.01983366 (.035612)	-.01628073 (.0529219)

Dependent variable / Independent variable	VW_BHAR2	VW_BHAR3
R – squared	0.0896	0.0873
F statistics	81.28	55.67
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors are indicated in parentheses		

The value weighted models are built for buy-and-hold abnormal returns as well. However, the models performed worse in terms of coefficient significance. I suggest these give no valuable insights about the studied topic.

Table 19 Value weighted BHAR models with 3-day CAR as independent

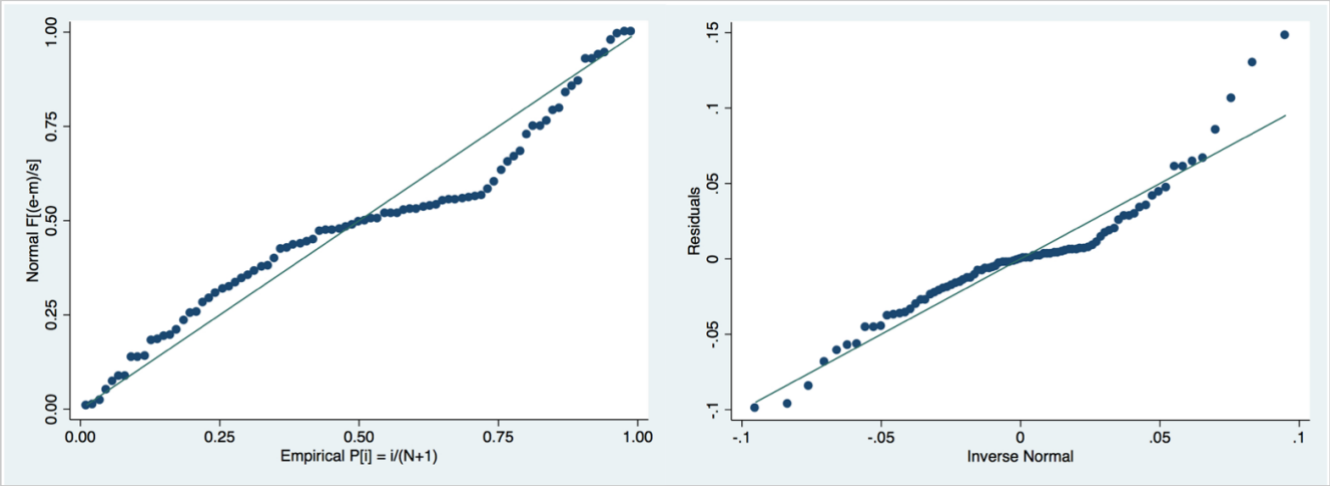
Dependent variable / Independent variable	VW_BHAR2	VW_BHAR3
CAR 3 day	-.00053736 (.0117079)	.00504269 (.0160103)
LN1age	.00016277 (.0011768)	.0008668 (.0020175)
Markettobook	$9.169*10^{-6}$ (.0000108)	.0000164 (.0000163)
LnTA	-.00064992 (.0017637)	.00104321 (.0025766)
Vol	-.00001145 (.000013)	-.00001454 (.0000183)
Leverage	$9.135*10^{-6}$ (.0000132)	$-3.153*10^{-6}$ (.0000197)
ROA	.00907094** (.0037182)	.01425444** (.0069198)
Liquidity	$-1.197*10^{-6}$ $(2.88*10^{-6})$	$4.644*10^{-6}$ $(5.23*10^{-6})$
Year_dummy	$-6.471*10^{-6}$ (.0014461)	.00106471 (.0026363)
Industry_dummy	-.00129844 (.002746)	.00081516 (.0049118)
constant	.01420893 (.0352374)	-.02130157 (.0524442)
R – squared	0.0787	0.0818
F statistics	99.49	66.83

Dependent variable / Independent variable	VW_BHAR2	VW_BHAR3
Prob > F	0.0000	0.0000
Note: * p<.1; ** p<.05; *** p<.01. The values of standard errors are indicated in parentheses		

The models with three-days CAR as independent show approximately the same results and could not be considered as valuable. It could be seen from Tables 16 & 17 that in two-year models the sign of size, i.e., logarithm of total assets changed, however since the coefficient is not significant, I suggest no violation of the validity. Moreover, in the short-term performance models from Tables 14 & 15, the signs of the size coefficient remain correct. The short-term performance, in turn, significantly influences long-run and because of this I assume the correct specifications of the models.

Since the OLS methodology implies several assumptions which were checked and some of them were slightly adjusted (e.g., normal distribution of dependent variable), I need also to check the specifications of the presented models. I admit that as of now there could be multicollinearity issue due to returns on assets and equity, but the tests are done. Besides, the tests on the omitted variables and normality of residuals should be provided since these are other assumptions of OLS. I suggest the VIF tests for omitted variables, for all the models it showed coefficients less than 10, which is threshold for this test. For assumption of residuals' testing the standardize normal probability plots and quantile-normal plots were made for better visual representation. The first shows tests for non-normality in the middle range of residuals, while the second – quantile checks the tails of residuals' distribution and compares them to normal. These procedures as well as analytical Shapiro-Wilk tests were made for all the models. Some of them are off lines and show slight deviation from normal distribution. The models with solid normal distribution of residuals are with one and three-year BHARs as independent. The others show slight deviation from the normal as displayed on the Figure 6. I suggest the models remain reliable and the interpretation could be outlined.

Figure 7 Normal probability plot & Quantile-normal plot for residuals



Source: [Made by author]

For the homoskedasticity concerns, i.e., constant variance of the residuals is tackled through the means of heteroskedasticity-robust standard errors calculation. Under heteroskedasticity issue, the estimates are considered to be not the BLUE (best linear unbiased estimators) since the variance is not the lowest, meaning violation of an important assumption and wrong estimates. The methodology of heteroskedasticity-consistent standard errors allows to tackle this issue by weighting the observations differently based on their values, e.g., outliers are with different weights. The other vital point to check for the regression models is whether we have right specification of the variables, i.e., the model has no omitted variables. The Ramsey RESET test was used for all the models. The null hypothesis in this test is that the model has no omitted variables. In all the cases, the p-value was higher than threshold of 0,05, hence suggesting failure to reject the null hypothesis. Therefore, analytical test suggests no omitted variables in the models.

Next important assumption of OLS regression models is that independent variables are not multicollinear. This assumption implies the absence of any correlation among the independent variables, i.e., they do not explain one thing. It has already been checked before models' construction; however, I suggest double check it since there could be changes after performing the regressions. If it is violated, the standard errors could be overstated and do not reflect the accurate values. The standard procedure of testing is given by variance inflator test:

Table 20 VIF tests for models

Variable	VIF (CAR model)	VIF (CAR3 model)	VIF (BHAR2 model)	VIF (BHAR3 model)
CAR3	N/A	N/A	1.11	1.11
LN1age	1.14	1.14	1.16	1.16
Markettobook	1.38	1.38	1.45	1.45
LnTA	1.19	1.19	1.25	1.25
Vol	1.03	1.03	1.03	1.03

Leverage	1.34	1.34	1.35	1.35
ROA	1.10	1.10	1.10	1.10
Liquidity	1.05	1.05	1.05	1.05
Year_dummy	1.13	1.13	1.15	1.15
Industry~y	1.21	1.21	1.21	1.21
Mean VIF	1.17	1.17	1.19	1.19

The standard rule of thumb indicating possible multicollinearity is VIF > 5, otherwise there is no multicollinearity concern. Therefore, I can state all the models performed good in this sense. Overall, I suggest that all the presented models are appropriate in terms of OLS assumptions with slight violations which are the matter of real-life data which by definition could not be perfect in all senses. One could also argue in favor of autocorrelation check or concern, however in the cross-section data the evidence of autocorrelation is not so obvious. I would suggest that the firms are not connected by the nature. Therefore, the models are considered as correct and the inferences will be made.

As it was stated previously, I am going to build another type of models – binary outcome which would suggest the probability of getting positive performance depending on different factors. It is non-linear type of models which gives predicted values to be either one or zero. In my case, the positive outcome is coded as one and negative is zero. The first model shows the influence of the earlier considered factors on the probability of positive buy-and-hold outcome:

Table 21 Logit regression model for 3-year BHAR

				Number of obs	85	
				Wald chi2(10)	20.32	
				Prob > chi2	0.0263	
Log likelihood = -49.418095				Pseudo R2	0.1611	
Binary_BHAR3	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
CAR3	6.8111872	3.3369	2.04	0.041**	.2709838	13.35139
LN1age	.20338222	.346702	0.59	0.557	-.4761411	.8829056
Markettobook	.03143973	.041763	0.75	0.452	-.0504142	.1132936
LnTA	.05860059	.2498928	0.23	0.815	-.4311804	.5483816
Vol	-.00817351	.0082329	-0.99	0.321	-.0243096	.0079626
Leverage	-.01195816	.0273459	-0.44	0.662	-.0655551	.0416388
ROA	2.6701088	1.366072	1.95	0.051*	-.0073439	5.347562
Liquidity	.00983947	.0367351	0.27	0.789	-.0621599	.0818389
Year_dummy	1.4290146	.8655382	1.65	0.099*	-.267409	3.125438
Industry_dummy	.38820172	.6877748	0.56	0.572	-.9598121	1.736216
_cons	-1.9383822	5.470424	-0.35	0.723	-12.66022	8.783451
Note: * p<.1; ** p<.05; *** p<.01						

First of all, I should mention that in such type of models, the coefficients should be carefully interpreted as they do not represent simply the slope coefficients or the rate of change and the influence on the dependent variable. Instead, these coefficients represent the rate of change of log odds within the change of dependent variable. In order to interpret the coefficients, we need to estimate the predicted probabilities of positive outcome, i.e., put them into formula (13) presented earlier. Since the logit model is another case, it relies on different form regular OLS methodology, the results not only in coefficients but in other metrics should be interpreted carefully. For example, the p-value of chi-squared statistics is testing whether the combined effect of all presented variables is different from zero. In this case, the model seems to be relevant and the effect is different from zero with 5% level of significance. Moreover, in this case, the other significance z-test is used in order to check the coefficients' difference from zero and the R-squared measure is not interpreted as the variance explained by the model. In the first model there are three significant variables: cumulative abnormal returns, return on assets and the year of issuance. I suggest paying attention to the signs of the coefficients. All the significant variables have positive signs. CAR measure, for example, recommends that companies with higher short-run performance indicators are more likely to have long-term positive performance. The value of this coefficient is significantly big in terms of absolute number. The next point is that companies with higher initial return on assets are more likely to have the positive aftermarket performance. The last dummy variable suggests that the common year without crisis would be beneficial for the aftermarket performance. The common practice for the interpretation of such type of models is that we need to find the marginal effects which are given by the formula:

$$\partial P_i / \partial X_i = f(\beta_0 + \sum \beta_i X_i) * \beta_i \qquad (14)$$

where f is the density function of the distribution. This partial derivative represents marginal influence of the estimates on the probability of positive outcome, it is called marginal effect. It is generally accepted that it is more informative way of coefficients representation and interpretation. Hence, given the certain prediction values made by model we could estimate the influence made by changing in one explanatory variable and how much it adds to the probability of positive outcome. For the presented model I have calculated marginal effect given all the independent variables:

Table 22 Marginal effects for 3-year BHAR

	dy/dx	**Delta-method Std. Err.**	**z**	**P>z**	**[95% Conf. Interval]**	
CAR3	1.37711	.6277877	2.19	0.028**	.1466686	2.607551
LN1age	.0411205	.0694811	0.59	0.554	-.0950599	.177301
Markettobook	.0063566	.0083381	0.76	0.446	-.0099859	.0226991

LnTA	.0118481	.0504148	0.24	0.814	-.0869632	.1106593
Vol	-.0016525	.0016626	-0.99	0.320	-.0049112	.0016061
Leverage	-.0024177	.0054891	-0.44	0.660	-.0131761	.0083406
ROA	.539852	.2705335	2.00	0.046**	.0096161	1.070088
Liquidity	.0019894	.0073801	0.27	0.787	-.0124753	.0164541
Year_dummy	.2717484	.1375835	1.98	0.048**	.0020897	.541407
Industry_dummy	.0774007	.1343978	0.58	0.565	-.1860141	.3408155
Note: * p<.1; ** p<.05; *** p<.01						

Therefore, given the results we can state that unit change in short-term performance would result in substantial change in probability of a positive return. The influence on probability of the return on assets and year is not as significant as the short-term performance. High values of volume of issuance and leverage variables seem to contribute negatively to the probability of positive outcome, but neither coefficients nor the marginal effects are significant.

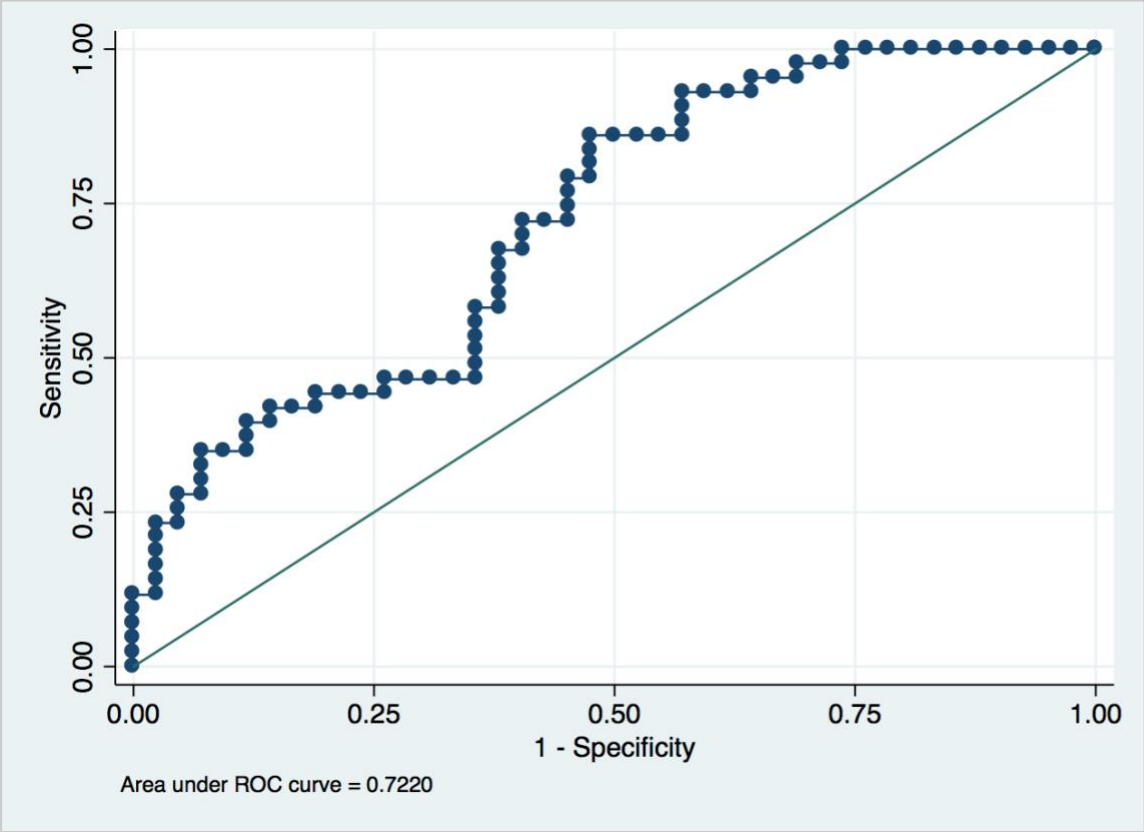
In order to estimate the goodness-of-fit of the model several methodologies could be used. One of the most reliable tests is classification table, which gives the understanding on how the model behaves on the predictions, i.e., it gives the number of correctly predicted values. Moreover, the indicators of sensitivity – proportion of correctly identified positive outcomes and specificity – proportion of correctly identified negative outcomes. The results are the following:

Table 23 Classification table for 3-year BHAR model

	--------TRUE--------		
Classified	D	~D	Total
+	29	16	45
-	14	26	40
Total	43	42	85
Classified + if predicted Pr(D) >= .5			
Sensitivity	Pr(+ D)	67.44%	
Specificity	Pr(-~D)	61.90%	
Positive predictive value	Pr(D +)	64.44%	
Negative predictive value	Pr(~D -)	65.00%	
Correctly classified		**64.71%**	

The model correctly identified approximately 65% of the cases with ~68% of positive correctly identified and ~62% of negatives with the cutoff value of 0,5. I suggest that the model could be evaluated as good and not mis specified. In addition to this goodness of fit measure, I build other graph which give the understanding of model's goodness-of-fit which is receiver operating characteristic (ROC). It plots the fraction of true positives (TPR = true positive rate) vs. the fraction of false positives (FPR = false positive rate). The area under the plot gives the notion of goodness, the more the better. In this case, the area is 0,72 which is a good result:

Figure 8 ROC curve for 3-year BHAR model



Source: [Made by author]

As we have observed in the first model, the absolute value of cumulative return coefficient is quite big and the marginal effect is also significant, hence I thought to remove this variable in order to detect the changes. The model is the following:

Table 24 Logit regression model for 3-year BHAR with elimination of CAR variable

				Number of obs	85	
				Wald chi2(9)	16.81	
				Prob > chi2	0.0518	
Log likelihood = -51.14981				Pseudo R2	0.1318	
Binary_BHAR3	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
LN1age	.28120014	.3401238	0.83	0.408	-.3854302	.9478304
Markettobook	.02164924	.0389833	0.56	0.579	-.0547565	.098055
LnTA	.16199699	.2347616	0.69	0.490	-.2981273	.6221213
Vol	-.00777607	.0068988	-1.13	0.260	-.0212975	.0057454
Leverage	-.00607005	.0255269	-0.24	0.812	-.0561019	.0439618
ROA	2.6232594	1.244785	2.11	0.035**	.1835253	5.062994
Liquidity	.00600322	.0033673	1.78	0.075*	-.0005966	.012603
Year_dummy	1.5162267	.8214883	1.85	0.065*	-.0938608	3.126314

Industry_dummy	.34653781	.6853381	0.51	0.613	-.9967002	1.689776
_cons	-4.0763203	5.190159	-0.79	0.432	-14.24885	6.096205
Note: * p<.1; ** p<.05; *** p<.01						

In this model, the main difference is that another factor became significant in terms of p-value. The liquidity is now influencing the probability of positive outcome and it influences positively, i.e., the companies with higher initial liquidity will more likely have positive buy-and-hold returns in three-year time horizon. The basic properties of the model have changed a bit, for example, the chi squared statistics of coefficients' difference form zero became higher, suggesting the model's worse performance. However, it is still significant on 10% level. Compared to the first model, the Pseudo R-squared measure decreased suggesting the CAR's presence of explanatory power, i.e., it influences the probability of the positive outcome and should be taken into account.

The marginal effects for this model are the following:

Table 25 Marginal effects for 3-year BHAR without model CAR variable

	dy/dx	**Delta-method Std. Err.**	**z**	**P>z**	**[95% Conf. Interval]**	
LN1age	.0593028	.0705992	0.84	0.401	-.079069	.1976747
Markettobook	.0045657	.0081772	0.56	0.577	-.0114614	.0205927
LnTA	.0341639	.0487292	0.70	0.483	-.0613436	.1296713
Vol	-.0016399	.0014482	-1.13	0.257	-.0044783	.0011985
Leverage	-.0012801	.0053714	-0.24	0.812	-.011808	.0092477
ROA	.5532243	.253719	2.18	0.029**	.0559442	1.050504
Liquidity	.001266	.0006956	1.82	0.069*	-.0000972	.0026293
Year_dummy	.2972548	.1305559	2.28	0.023**	.0413699	.5531397
Industry_dummy	.0723476	.1404956	0.51	0.607	-.2030187	.3477139
Note: * p<.1; ** p<.05; *** p<.01						

Thus, the elimination of the CAR variable presented in Table 25 resulted in addition of one more significant variable of liquidity during the time of initial offering. The unit change in all three variables will lead to the increase in probability of positive outcome. Therefore, this could be considered as valuable result.

Similar tests for goodness-of-fit are provided for the second model as well:

Table 26 Classification table for second logit model

	--------TRUE--------		
Classified	D	~D	Total
+	27	17	44
-	16	25	41
Total	43	42	85
Classified + if predicted Pr(D) >= .5			
Sensitivity	Pr(+ D)	62.79%	

Specificity	Pr(-~D)	59.52%
Positive predictive value	Pr(D +)	61.36%
Negative predictive value	Pr(~D -)	60.98%
Correctly classified		**61.18%**

According to the classification table the second model performed slightly worse than the first. It is not a surprise due to the elimination of an important variable.

Since the two-year benchmark adjusted buy-and-hold returns are significantly different from zero, I suggest building the logit model for them as well in order to see the significant variables which influence this performance. The same methodology is applied. The results of the model are the following:

Table 27 Logit regression for 2-year BHAR

				Number of obs	85	
				Wald chi2(10)	25.75	
				Prob > chi2	0.0041	
Log likelihood = -43.962683				Pseudo R2	0.2520	
Binary_BHAR2	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
CAR3	11.92014	4.24142	2.81	0.005***	3.607108	20.23317
LN1age	.0702602	.3352916	0.21	0.834	-.5868993	.7274197
Markettobook	.0097277	.0163298	0.60	0.551	-.0222781	.0417336
LnTA	-.6013281	.2595452	-2.32	0.021**	-1.110027	-.0926288
Vol	-.0066358	.0049637	-1.34	0.181	-.0163644	.0030927
Leverage	.0241477	.0319749	0.76	0.450	-.0385219	.0868172
ROA	4.526301	2.084171	2.17	0.030**	.4414015	8.6112
Liquidity	-.1784915	.1092898	-1.63	0.102	-.3926956	.0357127
Year_dummy	.4753893	.9632272	0.49	0.622	-1.412501	2.36328
Industry_dummy	-.0110457	.6647156	-0.02	0.987	-1.313864	1.291773
_cons	12.58782	5.68527	2.21	0.027**	1.4449	23.73075

Note: * p<.1; ** p<.05; *** p<.01

As we can observe from the Table 27, the logit regression model for two-year BHAR performance as independent performed better than previous models in terms of overall significance and in terms of Pseudo R-squared measure. This suggests that the presented variables explain the probability of positive outcome in two-year performance much better than for three-year. The number of chosen variables which are significant is also higher. We can see that four of six variables are significant and influence the performance. In order to see the probability's influence, I also build the marginal effects table which was explained earlier:

Table 28 Marginal effects for 2-year BHAR

	dy/dx	Delta-method Std. Err.	z	P>z	[95% Conf. Interval]	
CAR3* **	1.509991	1.34999	1.12	0.263***	-1.13594	4.15592
LN1age	.0089002	.04459	0.20	0.842	-.078492	.096292
Markettobook	.0012323	.00243	0.51	0.611	-.003521	.005986
LnTA	-.0761736	.05685	-1.34	0.180**	-.187601	.035254
Vol	-.0008406	.00089	-0.95	0.344	-.00258	.000899
Leverage	.0030589	.00356	0.86	0.390	-.003916	.010034
ROA	.5733719	.50305	1.14	0.254	-.412591	1.55934
Liquidity	-.0226105	.0061	-3.71	0.000***	-.034559	-.010662
Year_dummy	.0682109	.15509	0.44	0.660	-.235761	.372182
Industry_dummy	-.001396	.08363	-0.02	0.987	-.165303	.162511
Note: * p<.1; ** p<.05; *** p<.01						

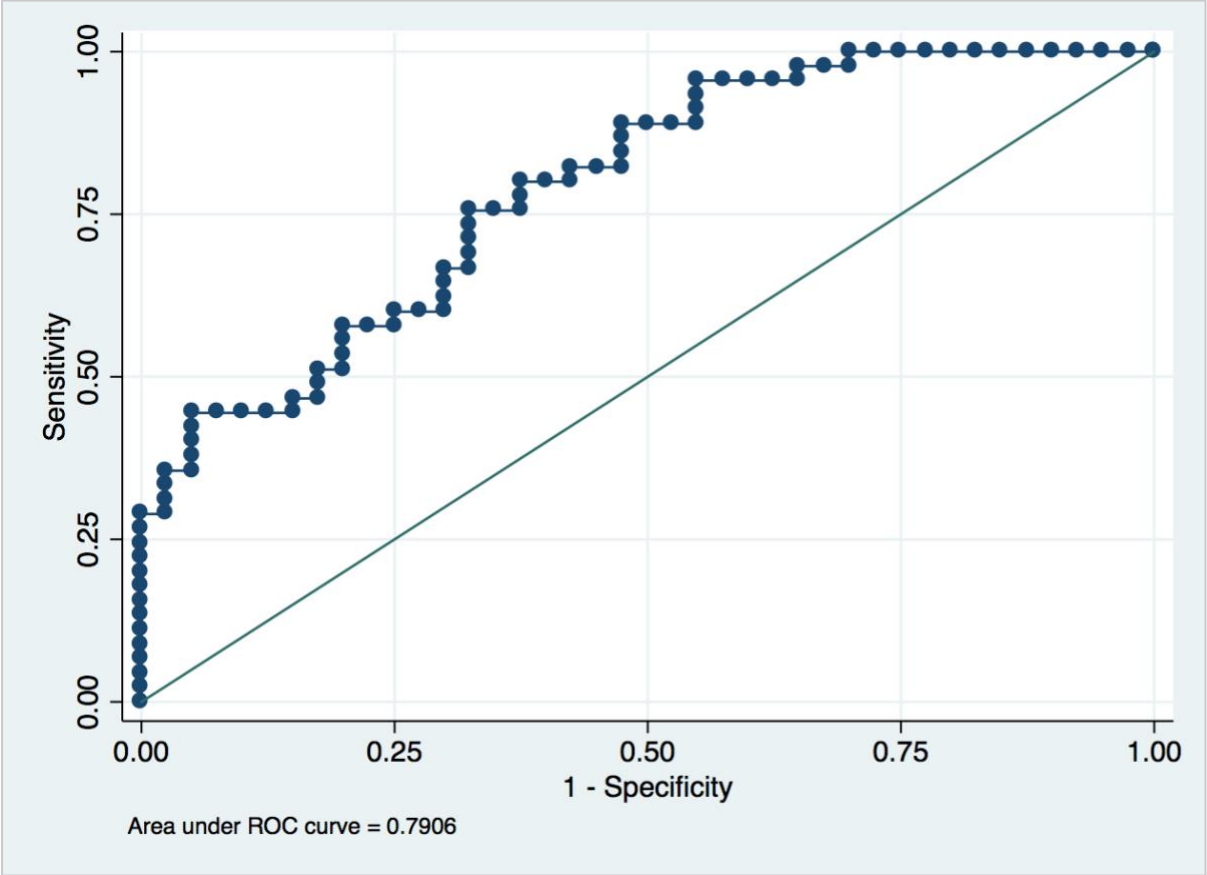
Again, we can see how short-term performance substantially influences the probability of positive outcome, i.e., the positive long-run abnormal returns. Moreover, the companies with higher total assets less likely to have positive performance on the two-year horizon. I suggest this situation when the signs of variables have changed could happen due to differences of time frames. Here the two-year performance is considered, and probably due to some events total assets have negative impact on this performance measure. The overall assessment of the model is also performed, goodness of fit is measured. The classification table is the following:

Table 29 Classification table for 2-year BHAR logit model

	--------TRUE--------		
Classified	D	~D	Total
+	34	15	49
-	11	25	36
Total	45	40	85
Classified + if predicted Pr(D) >= .5			
Sensitivity	Pr(+ D)	75.56%	
Specificity	Pr(-~D)	62.50%	
Positive predictive value	Pr(D +)	69.39%	
Negative predictive value	Pr(~D -)	69.44%	
Correctly classified		**69.41%**	

According to this analysis, we observe that the model performed better in terms of correctness of predictions. The overall percent is around 70% whereas the previous models' values were around 61%. This would suggest the better fit of the model and explaining power of the variables. The ROC plot of sensitivity is presented as well:

Figure 9 ROC curve for the 2-year BHAR logit model



Source: [Made by author]

We can observe that the value of area under the curve is also higher. Which, again, indicates the better performance of the model. The same significant influence of the short-term performance (CAR variable) is observed in Table 28. Therefore, I suggest trying to drop this variable and see the results without it. This is suggested because short-term performance is by nature of calculations indicates higher probability of long-run performance. The elimination of insignificant variables could be done as well, however there is still a room for becoming a significant. Hence, only CAR is dropped. The results of the model are the following:

Table 30 Logit regression for 2-year BHAR without CAR variable

	Number of obs	85
	Wald chi2(9)	19.53
	Prob > chi2	0.0210
Log likelihood = -47.960557	Pseudo R2	0.1839

Binary_BHAR2	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
LN1age	.182814	.3317151	0.55	0.582	-.4673357	.8329637
Markettobook	.005978	.0064405	0.93	0.353	-.0066451	.0186011
LnTA	-.3687846	.2156303	-1.71	0.087*	-.7914122	.053843
Vol	-.0060512	.0037498	-1.61	0.107	-.0134007	.0012983
Leverage	.0207436	.0274851	0.75	0.450	-.0331261	.0746133
ROA	4.319361	1.843753	2.34	0.019**	.7056706	7.933051
Liquidity	-.1957516	.099328	-1.97	0.049**	-.390431	-.0010722
Year_dummy	.9352844	.9957971	0.94	0.348	-1.016442	2.887011
Industry_dummy	-.2051673	.6524205	-0.31	0.753	-1.483888	1.073553
_cons	7.816228	4.862254	1.61	0.108	-1.713615	17.34607
Note: * p<.1; ** p<.05; *** p<.01						

We can observe the results of elimination of CAR variable in Table 30. This resulted in addition of liquidity variable significance, the same situation as in three-year model. Despite slightly worse performance in terms of Pseudo R-squared and overall significance, we can get another insightful result. The other iterations, i.e., drops and additions of variables were performed and have not resulted in any additional significant variables. The marginal effects are also presented:

Table 31 Marginal effects for 2-year BHAR

	dy/dx	**Delta-method Std. Err.**	**z**	**P>z**	**[95% Conf. Interval]**	
LN1age	.0209354	.04533	0.46	0.644	-.067908	.109778
Markettobook	.0006846	.00101	0.68	0.499	-.001298	.002668
LnTA	-.0422323	.03274	-1.29	0.197	-.106393	.021929
Vol	-.000693	.00065	-1.07	0.286	-.001966	.00058
Leverage	.0023755	.00286	0.83	0.407	-.003237	.007988
ROA	.4946429	.40097	1.23	0.217	-.291238	1.28052
Liquidity	-.022417	.00699	-3.21	0.001	-.036108	-.008726
Year_dummy	.1377107	.1885	0.73	0.465	-.231741	.507163
Industry_dummy	-.0224584	.06822	-0.33	0.742	-.156177	.11126
Note: * p<.1; ** p<.05; *** p<.01						

The results presented in the Table 31 suggest that, again, significant coefficients of size and liquidity have negative influence on the probability of positive long-run two-year performance. The common regression models presented in Tables 16 and 17 support the idea about direction of size' influence, suggesting that on two-year time horizon there is slight negative influence on exactly this performance. Still, we should be very careful with interpretation of marginal effects since the meaning of the variables should be taken into account. For example, in the models with cumulative abnormal returns (models in tables 22 & 28) the factor of CAR adds approximately 1.5 to the probability of positive outcome at the representative values of other

variables. However, these additions by nature are not possible since the probability could not exceed one, this just means that the influence is significantly high. More precisely, for example the increase of 0.001 in CAR would result in increased probability by 0.0015. Therefore, I suggest values and signs of marginal effects are crucial in interpretation. And the significant influence of CARs was the reason to observe the models with their elimination.

Overall, the comprehensive analysis of factors' influence which presented above aims to draw conclusions and outline connections. Moreover, the empirical analysis is aimed to either reject or confirm the hypotheses that were stated earlier. The summary table is presented:

Table 32 Summary of hypotheses' results

Hypothesis	Description	Outcome
H1: The long-run aftermarket performance of growth capital-backed IPOs is positive	Statistically different from zero means results on two- and three-year BHARs suggest overperformance	Confirmed
H2: Leverage have positive relation to the long-run aftermarket performance	Common as well as binary outcome models suggest absence of statistical significance of this coefficient (see Tables 17, 19, 21, 24 & 27)	Neither confirmed, nor rejected
H3: The higher proportion of issued shares volume relative to shares outstanding have negative influence on long-run aftermarket performance	Results in Table 17 suggest negative association with two- and three-year BHARs	Confirmed
H4: Higher indicator of operating liquidity in a company during initial offering positively influences long-run aftermarket performance	Controversial results due to different signs in common model (Table 17) and in binary outcome (Tables 24 & 30). Hence, it could contribute to the probability of negative abnormal return and I suggest rejecting the hypothesis	Rejected

2.6. Managerial implications

The presented chapter is aimed to discuss the results obtained and the managerial implications which could be drawn from the performed analyses.

For the managerial or practical implications, I would outline the major interested players who can benefit from the results of this paper. These players could be divided into internal and external. Internal players include managers of those companies, boards of directors and initial shareholders and I also relate intermediaries which take part in initial offering to this category

since they are basically selling the company's stock and know more about it. The external players include mainly investors who can be retail or institutional (mutual/hedge funds, insurance companies, pension funds, investment advisors) and their analysts. These investors also could be viewed from time horizon of investments perspective, i.e., they could be either long-term or short-term investors, those strategies are mainly depending on goals and could not be specifically outlined.

The presented research is useful for both sides of process, it could potentially benefit in terms of acceptance support of strategically important decisions. First of all, the internal side could be aware of their company's conditions and factors of IPO successful performance. More precisely, if a company is aware that it has similar features of growth capital-backed firm and there are some significant determinants of future success, it could evaluate the current condition and areas for development. Moreover, the internal player which plays significant role in initial offering procedure is underwriters. Since they basically sell and distribute the shares, they also do marketing campaigns before pricing, they collect the orders etc. Moreover, there exists special type of call option which is called "green shoe" or overallotment option. This is basically underwriters' right to sell more shares to public usually within 30 days after an IPO. Hence, if there is an upside and high demand the option could be exercised. The decision of this exercise could be supported by short-term performance presented in the results meaning that underwriter banks could anticipate potential upside and positive returns in the next days after an IPO and the support of exercise idea is presented. Therefore, the results of this paper could potentially be attractive for marketing reasons and could provide an additional measurement for investment and share distribution analysis.

The owners of the business and VC funds which finance those companies could also benefit since they understand the performance patterns and what factors influence those performance, therefore could leverage the potential offer size and price during an IPO for the returns' maximization in terms of remaining share. From the top management perspective, the factors of influence and their direction could play role, so they could strategically decide on which operating indicators to focus and why. Undoubtedly, this focus on precise indicators would not certainly guarantee the successful performance but could be useful milestones for evaluating further strategy. From the investors' perspective, i.e., the second side of interested parties, this research could contribute in terms of specificity awareness. More precisely, institutional or retail investors could have another measure to evaluate a company and what projected long- and short-run performance it would have. The analysts also could estimate the factors and indicators which influence the performance in both time horizons. For example, if the investor is aimed to exploit speculative strategy and more oriented on short-run investments, he or she should take into account

the leverage, age and market-to-book which company has at the very moment of initial offering which could help to estimate potentially most beneficial investments. The same is applied to long-run investments, i.e., short-term performance, issuance volume and operating liquidity should be taken into account. Thus, both time frame investors have the indicators in which to focus.

According to the models performed, higher size of the company measured as total assets and leverage could contribute positively to the short-term performance, while higher market-to-book ratio could negatively influence this performance. The market-to-book ratio could indicate the investors' perception of a stock, and the relative value of net assets since used in denominator. Therefore, companies which are "overpriced" relative to net assets perform worse in short-term horizon and it could potentially influence long-run performance as well. Besides, volume of an issue and liquidity represent significant influence on the long-run aftermarket performance, while relative volume has negative impact, the leverage seem to influence positively. This would bring the idea of perception of these two indicators, e.g., the higher proportion offered to public could possibly be the sign of future underperformance. However, the important consideration should be made since there is a presence of venture capital financing and its role and ownership structure should be taken into account. Moreover, what are the conditions and(or) covenants are negotiated with this VC fund during the deal. The leverage again could be an indicator of developing company, reduced agency problem and more effective execution of investment projects with usage of debt capital. It is considered to be cheaper way of financing since the tax is deductible. During implementation of probability models and observing the factors of positive performance, none of these factors contributed apart from short-term performance. However, one noticeable thing was detected – the influence of return on assets indicator. The indicator shows the efficiency of assets' utilization, moreover it takes into account liabilities. The main issue is the industry specific, i.e., different industries by nature have different asset base. I suggest this issue is eliminated by the sample since growth capital-backed companies are specific by nature and their ROAs could be compared across the presented industries. In some of the earlier models, this indicator was significant as well. Therefore, it is an important insight in the specifics of such firms and their performance after initial offering. The investors not only expect the projected investments in tangible assets but also effective utilization of the assets on the moment of IPO. This suggests that companies are expected to be profitable relative to resources that it owns/uses for operations.

Overall, the second empirical part evidence the substantial overperformance of growth capital-backed companies. Moreover, the factors of companies' performance as well as their influence are introduced. The growth capital-backed companies are a complicated concept, which is hard to identify. Their substantial long-run aftermarket performance could be caused by various events and factors. In this paper I document significant influence of short-run performance on the

long-run, the influence of leverage, proportion of shares issued and return on assets of the company at the moment of initial offering. Stated above managerial implication could be implemented if those companies are correctly identified. I can conclude that the main issue is still in identification of those type of firms.

2.7. Limitations

In this chapter I am going to analyze potential pitfalls and limitations of the presented research. This could give an understanding and ground for further improvements of the study. The summary of research limitation will be divided according to the process of the analysis – chosen methodological approach, data, its analysis and conclusions inferred from the analyses' results.

I would firstly start with the main potential limitation of the research which is more conceptual and general. This limitation is basically connected to the definition of the growth capital-backed companies. The theoretical foundation of the presented research is fully derived from one researcher who has defined and identified the properties of growth capital-backed companies which mainly invest in the growth of tangible assets and projected acquisitions. The ownership structure is also defined, they should have some venture capital financing with unlimited control (Ritter, 2015). It is stated in the article that there is a large proportion of VC investments which are hard to identify either as pure venture capital or as classic buyout investing. The goals of stakeholders and the role of investors is not as clear as in pure private equity financing. Therefore, this complication is a ground for the identification of the special type of initial offerings. Moreover, the scope of industries presented in the growth capital-backed companies is opposite to the pure venture capital mainly associated with technological and biotech industries which are highly dependent on the intangible assets/technology/research and development fields while the growth capital-backed are mainly in restaurant, airlines, healthcare and retail business. These are suggested to be more capital-intensive industries, i.e., require more tangible assets due to the nature of business. Thus, the growth capital-backed pool of companies was naturally distinguished from the uncertainty of the goals and character of investments. The concern about what makes them perform better is more of an interpretation question, which could have the various answers. I suggest that these companies are operating in well-established industries with lower risk of uncertainty and lower dependence on the technology making them stable investment. And if the company has stable operations, it could grow organically by investment in tangible part of operations resulting in good performance. Overall, I indicate the nature of these typology as a concern because it could have potential flaws or extensions in further researches.

The other limitations of this paper include each processes' bottlenecks. Starting from the chosen methodological approach, I indicate the justification of the choice, however it could be arguable and other approached could be applied. For example, competing to buy-and-hold measure

there is a Fama-French three factor model (also called calendar time abnormal return) which could have potential benefits over the BHAR. It is a potential extension to the current paper. The next potential limitation is data collected, due to time constraints I have created the most recent sample starting from 2007, accounting for market distress. However, the extension could be applied for better generalization of the results. Moreover, the second part of the analysis is aimed to identify important factors which influence the performance. This analysis is not checking the causal relationship between factors since it is hard to take into account all the determinants of the initial offering performance, i.e., there could be a significant number of them. It could be a possible extension for future researches. The last limitation is mainly referred to the conclusion part since the interpretation errors could be made and wrong implications inferred. However, I suggest these concerns are not violated and proper work is done.

CONCLUSION

The presented research is aimed to identify long-run performance of specifically financed initial public offerings – the type of venture capital financing which is called growth capital-backed. This type was defined by Ritter (2015), he concluded that these companies have significant positive three-year abnormal returns which outperform other types of financing and non-backed companies. The results of his paper indicate approximately 14% average benchmark adjusted buy-and-hold returns for growth capital-backed compared to negative values for non-backed and VC-backed initial offerings. Therefore, the goal of this paper was to examine the long-run performance of a specifically financed (growth capital-backed) IPOs and to observe which factors influence such performance. This type of companies is characterized by three main features: financial sponsor during the IPO deal is necessary; controlling position of the sponsor is not limited and third criterion is the most important – financial sponsors are investing in growth of either tangible assets or in projected acquisitions

For the first part of performance identification, the theoretical background was described, and the appropriate methodology was chosen with justification in favor of it. The market proxy of performance was chosen, cumulative and buy-and-hold returns were calculated since they are considered as more useful proxy for external users. These methodologies imply sufficient and more comprehensive information inside rather than operating indicators of company's performance. Along with long-run performance calculations, short-term was calculated as well in order to observe the patterns and its further influence on long-run. The sort-term performance was calculated with cumulative abnormal returns while long-run with the help of buy-and-hold abnormal returns. Those return calculations are called abnormal as they imply calculation of returns relative to the benchmark. Since all the companies are listed either on Nasdaq or on NYSE stock exchange, the NASDAQ Composite index (IXIC) was chosen as the benchmark.

For the analysis the sample of 85 growth capital-backed companies was created, the data is retrieved either from Thomson Reuters or from open sources such as IPO prospectuses. The sample created by Ritter included time period prior to 2012. The sample of this paper includes initial offerings till 2018. This extended sample includes market distress years of 2007-2009 which were controlled through binary variable. The chosen time frame of the sample induced by the fact that partially the necessary data was collected manually as not all of the indicators are presented in the data base. The identification of the companies which are growth capital-backed was made according to Ritter's data base since he is a pioneer in those researches. The second empirical analysis implies models' creating and observation of factors' influence. Theoretical foundation for factors' identification and justification of proxies is presented. Moreover, the expected influence is determined for almost each factor. The other important thing was made is the introduction of

industry variable since there are some companies from financial sector, this was tackled through binary variable as well. The hypotheses were stated according to previous researches:

H1: Growth capital-backed companies have positive three-year benchmark-adjusted buy-and-hold abnormal returns.

H2: Leverage would have positive relation to the three-year aftermarket performance.

H3: The higher proportion of issued shares relative to shares outstanding would have negative influence on three-year aftermarket performance.

H4: The presence of higher operating liquidity in a company during initial offering positively influences three-year aftermarket performance.

The methodology applied for observation of influence and for hypotheses' confirmation is OLS regression models which allow to detect the direction of influence and the significance of the coefficients. Moreover, as there are sufficient number of positive and negative buy-and-hold returns, I applied logit model of nonlinear relationship in order to examine the influence of factors on the probability of positive outcome, i.e., positive abnormal return. The results confirm the main hypothesis about growth capital-backed initial offerings overperformance of approximately 19% in three-year time horizon which is consistent with the findings of Ritter (2015). The third hypothesis was confirmed as well, while the fourth is rejected and the second could not be either confirmed or rejected. Moreover, the significant determinants of two- and three-year aftermarket performance were identified. Those are: short-term performance, volume of issuance, liquidity and return on assets. According to various linear and non-linear models, these factors could either positively or negatively influence the performance. The return on assets could contribute positively to long-run aftermarket performance since some were statistically significant. Therefore, the results suggest not only that those firms actually perform better than non-backed or typical VC-backed but also give insights on what influence this performance.

The presented research is considered to partially close the academic/research gap since Ritter is the only academician who investigates those type of initial public offerings. In terms of practical importance, the paper gives important insights on the performance of the companies after an IPO deal, proved with relevant data analysis, and it could be useful in terms of additional instrument for analysts and investors to consider. The practical importance could be for various stakeholders: internal such as owners, management and intermediaries, and external such as retail and institutional investors. Since growth capital-backed initial offerings are performing greater in long-run it could help to sustain decisions for both sides of stakeholders. More precisely, owners could justify their value maximization, investors and analysts could rely on the research about factors for better IPOs' assessment and intermediaries could also complement their analyses for more comprehensive decision-making process.

The further development of the research could be made in terms of conceptual background, i.e., more standardized and solid identification of growth capital-backed companies could be performed. Moreover, the sample extension in terms of time span could be implemented. The other development issue of operating performance could be applied. Since I have evident only aftermarket performance, it could be insightful to observe what happened to operating or accounting indicators of a company and what possible factors of those performance.

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